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POLITICAL, SOCIOLOGICAL AND MILITARY AFFAIRS

INTRODUCTION TO NATIONAL DEFENSE MODERNIZATION

CHAPTERS XI, XII, XIII

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INTRODUCTION TO NATIONAL DEFENSE MODERNIZATION

CHAPTERS XI, XII, XIII

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CONTENTS

Chapter 11: Modern Logistics Support

[Text] I. Modernized Warfare Cannot Be Separated From Modernized Logistics

Modern warfare cannot be separated from modernized logistics. If there is no modernized logistics, none of the modernized weapons can "go into action." An old Chinese saying goes, "Food and fodder should go before troops and horses." A foreign saying goes, "The motive power for war comes from the rear." These sayings show the important role of logistics work in war. In a modern war, we can say that every military action is restricted by its logistics support. If in a war logistics supply is suddenly cut off, what situation will appear? The aircraft and guided missiles will "have wings but find it hard to fly"; the tanks and cannons will be "paralyzed in their four limbs"; and the military man himself, because supplies are cut off, will lose his combat effectiveness. Therefore, in modern warfare there is a greater dependence on logistics, specifically for the following reasons.

1. The Consumption of Materiel in Modern Warfare Is Astonishing, and the Task of Supply Is Arduous. In the initial stage of World War II, although there were hundreds of thousands of kinds of combat materiel, compared to the variety today this number is insignificant. Today there are more than 3 million kinds of military materiel. There has also been a considerable change in the proportion of materiel. POL has risen to first place, ammunition is in second place, and supply materials have gone back to third place. The amount of materiel consumed has also increased to an extraordinary degree. Take one soldier for example. During World War I, he consumed 6 kilograms a day; in World War II, this amount increased to 20 kilograms; and in the regional wars since the 1960's, the amount has risen to 90 kilograms, greatly increasing warfare's dependence on logistics.

2. The Casualty Rate Is High, the Wounds Are Complex, and the Task of Treatment and Cure Is Formidable. In World War II, there was a total of 39.06 million casualties among the major combatant countries--the Soviet Union, China, U.S., Britain, France, Germany, and Italy. The number of modern casualty-producing weapons has not only increased, but also their accuracy is high and their power great. The rate of casualties on the battlefield has risen markedly, and wounds have become very complex. Personnel can suffer many and varied injuries. Although the Fourth Middle East War lasted only 18 days, the total number of casualties on both sides reached 20,000. Such being the case in a conventional war, if in a future war nuclear, chemical, and biological weapons are used, there will be a large number of cases of radiation sickness, infectious diseases, toxic wounds, and compound wounds. The rate of serious wounds will be higher, and the demand for timeliness in emergency treatment will be more pressing. If severely wounded personnel do not get timely emergency treatment, they will quickly die; if lightly wounded personnel cannot be swiftly cured so that they return to the frontline, combat effectiveness will be sharply reduced. Therefore, it is necessary to have quite strong medical support to meet this demand.

3. The Struggle for Lines of Communication Is Intense, and the Task of Transport Between Front and Rear Is Pressing. In wartime, a large amount of combat materiel must be transported in a steady, uninterrupted stream along

lines of communication to the frontline, and a large number of wounded and sick personnel must be transported from the frontline to the rear along lines of communication. The struggle by the two sides in a war for lines of communication and transportation has always been extremely intense. During World War II, Hitler did all he could to cut the rear supply lines of the Allied armies. The Allied armies also paid a considerable price to cut the German Army's supply lines. Eisenhower even personally commanded a bomber group that bombed the German Army's supply lines. During the war of aggression against Vietnam, in order to cut the "Ho Chi Minh Trail," the U.S. forces sent out an average of 400 bomber sorties a day, dropping 3,000 to 4,000 bombs of various types. On both sides of the trail 2 to 3 kilometers of trees were almost completely "whittled away." Now, in order to mount aggression against other countries, the hegemonists have formulated set after set of plans to destroy the lines of communication of other countries, making the "destruction of a country's overland communication lines...to adversely affect its capability to successfully prosecute a war" an important means of war. It can be imagined that, in a future war, the struggle for communication lines between bombing and counter-bombing, raid and counter-raid, and sabotage and counter-sabotage will be even more intense. It can be said that communication lines are the lifelines that insure victory in war.

4. The Damage Rate of Weapons and Equipment Is High, and the Amount of Technical Support Is Large. During the Fourth Middle East War, the damage rate of the tanks and armored vehicles of the two sides was 50 percent, a total of about 4,600 vehicles. Because of the Israeli Army's timely and highly efficient maintenance measures, not only did it repair 700 of its own tanks within a few days, but also it repaired several hundred tanks that it had captured from Syria and 867 it had captured from Egypt, and threw them into battle again, swiftly making up for its insufficiencies in armor and maintaining its capacity for continued operations. Because Egypt and Syria had been held on a tight rein by the Soviet Union, it was hard for them to organize rush-repairs on the battlefield and their combat effectiveness was not restored as quickly as Israel's was. In a future war, the total damage rate of weapons and equipment will be as high as about 30 percent, and in certain local areas could even reach 50 percent. For example, when a 1 million-ton class nuclear bomb is exploded on the ground, it can inflict medium damage on armor on the surface within a radius of 10,000 meters and medium damage on underground storehouses within a radius of 7,000 meters. This necessitates the strengthening of technical support forces and the supply of timely, highly efficient technical support. Otherwise, combat effectiveness cannot be swiftly restored, a situation which would make it difficult to vanquish the enemy.

5. The Rear Will Also Become a Battlefield, and It Will Both Have To Provide Logistics Support and Engage in Combat. Modern warfare is three-dimensional. The two sides in a war will both have combined arms forces composed of large corps, and both can use long-range weapons such as guided missiles and strategic bombers to conduct wanton and indiscriminate attacks on important targets in the enemy's rear. They both can use airborne forces to make sudden and violent attacks, use tank and armored units to make swift surprise attacks, use special units to conduct harassing attacks and sabotage, and so forth. The rear area will also become a battlefield. Therefore, to set up a

logistics contingent capable of combat, to improve the rear area's defensive capability, and to insure the rear area's security is a problem that must be solved in modern logistics support. While supporting operations at the front, the rear area must fight against air raids, airborne landings, surprise attacks by tanks and armored vehicles, harassing attacks and sabotage. If this struggle is not conducted well, the security of the area's manpower, materiel, and lines of communication will be seriously threatened, thereby adversely affecting the completion of its support task and even causing a defeat in the war.

From this it can be seen that, while vigorously promoting the modernization of weapons and equipment, it is necessary to attach extreme importance to the modernization of logistics. People now regard logistics, along with strategy and tactics, as the three key elements in guiding war, and the reason for this is to be found herein.

The principal parts in modernizing logistics are: setting up modernized conditions for materiel and technical support and dependable rear bases, strengthening scientific research on logistics, raising the level of scientific management and the organizational and command capabilities of logistics, and improving the technical equipment of logistics, so that the supply of materiel, the prevention and cure of sickness and wounds, the management of reserves, transportation, and technical support meet the needs of modern warfare. This is also to say that in modernized logistics there must be timely, accurate materiel support, rapid and high-quality protective services, communication and transportation lines extending in all directions, and rapid and varied rush-repairs on the battlefield.

II. Timely, Accurate Materiel Support

The problem that modernized logistics must first solve is the timely supply of the operational materiel needed by the units. Currently many countries are conducting conscientious research and reforms, and their principal methods are: manufacturing highly efficient, multipurpose operational materiel, scientifically and rationally managing reserves, and timely and accurately providing materiel support.

A. Highly Efficient Multipurpose Materiel

1. Small in Bulk But Great in Power. A 100,000-kilowatt thermal power station burns more than a thousand tons of coal a day, but if it is converted to nuclear fuel--uranium--it will not need to use even one jin of uranium a day. Thus, a nuclear submarine, which uses atomic reaction for its motive power, can stay under water for several months, can circumnavigate the globe several times, and go without refueling for a long time. In bulk the modern handgrenade is only as big as a ping pong ball. Its casualty-producing area is five square meters, and its power is not inferior to that of the handgrenades of the past. Other ammunition is being miniaturized in an effort to make them small in bulk, light in weight, but without a reduction in power. These kinds of operational materiel have greatly improved the carrying and delivering capacities of the units and have markedly improved their combat effectiveness.

2. Less Variety But More Uses. To support a war, there are now more and more operational materiel. This fact causes more and more difficulties for design, production, use, maintenance, storage, and logistic supply. To both meet the needs of war and as much as possible reduce the variety of operational materiel, many countries have standardized, systematized, and made interchangeable their military equipment. The variety is less, but the number of uses has not been reduced. For example, new-type combat uniforms that are made of multilayered compound materials that are soft, warm, and washable have a variety of uses: a uniform for protection against cold weighs less than a kilogram, is both lightweight and warm, and does not adversely affect the body's movement. When its artificial wool liner is removed, it becomes a summer uniform; its outer garment is a light plastic film, which can become a raincoat; the zipper-attached lower hem of the jacket and the head cover can be used as a sleeping bag; and the nylon belt can be put up and fastened into a hammock. There are even wider uses for the nylon-coated protective suit. Not only can it provide protection against wind, water, fire, and bullets, but also it can provide protection against chemical toxicants, photoelectric reconnaissance, and nuclear flashes. It combines a camouflage uniform, combat uniform, work uniform, raincoat, sleeping bag, winter uniform, and summer uniform into one multipurpose garment suited for operations in different war zones and different climates and suited for different service arms. If space navigation liquid coolant is put into this garment, tank and armored vehicle crews who wear it will not feel the heat of summer.

In addition, by using superfine materials, plastics, chemical fibers, and light metals, and by manufacturing weapons and equipment with new technologies such as modifying, synthesizing, and compounding, one thing, one machine, one gun, one uniform, and one oil will have multipurposes, thereby greatly simplifying design, production, use, maintenance, storage, and logistics support.

3. Mobile and Handy. Highly mobile operational actions require highly mobile materiel support. To attain this goal, there are now some new pieces of equipment. First, there is the container. It has the characteristics of being a whole, being multipacked, and being convenient to transport. No matter whether it is a case of transport by water, air, rail, or road, and no matter whether it is a case of transfer or nontransfer transport, the container can be used. The container can be said to be a movable warehouse. Second, there is the movable assembly of various kinds of materials.

Collapsible portable equipment possesses the characteristics of being ingenious and mobile. For example, there box-type portable houses, air-filled tents, bellows-type portable houses, closed railway car semidetached barns, new mobile field hospitals, mobile kitchens, and air-transported portable houses. Not only are these new pieces of equipment made of lightweight materials, simple in structure, and collapsible, but also they are suitable for various modes of transport. Several Liberation-brand trucks can haul houses for an entire regiment.

B. Rational and Scientific Management of Reserves

1. Rational Materiel Reserves. This mainly means rational reserve points, reserve work division, and reserve measures. Making reserve points rational means deploying warehouses based on the requirements of the strategic policy, so that they can support both fortified defense operations and strategic operations. In this way, no matter what kind of war is being fought and no matter at what place it is being fought, there will be the materiel necessary to satisfy the war's needs.

Rationality in the division of work and the means for materiel reserves means that strategic reserves, campaign reserves, and tactical reserves are all given their own emphasis. For strategic reserves there must be reserves of strategic materiel; for campaign reserves there must be reserves based on the operational characteristics of the war zone. Tactical reserves must be able to insure the comprehensive needs of a battle. The means for strategic and campaign reserves mainly consist of having permanent, fortified underground warehouses. The means for tactical reserves mainly consist of field warehouses that accompany the forces, and their types are: truck-carried warehouses, air-filled warehouses, containerized warehouses, boxed movable warehouses, and large storage tents. Their characteristics are high mobility and the ability to accompany units on the move.

2. Scientific Management of Materiel. The scientific nature of materiel management is prominently shown in warehouse management and battlefield management.

Warehouse management has been automated. Machines have been substituted for people in the major links of operations inside a warehouse, such as loading and unloading materiel, receiving and dispatching materiel, conveying materiel within the warehouse, stacking materiel on shelves, and inspecting and managing materiel. The control room of a modern military warehouse is usually composed of four computers with a complete set of equipment. One computer keeps the data and files on all materiel in the warehouse. One computer controls the automatic cargo-handling trucks. One computer handles the data terminals at all positions in the warehouse. One computer is the warehouse's central data processor. Fitted onto a cargo-handling truck is an electronic microcomputer, which has a television screen, an alphabetic-numeric keyboard, a card reader, and a printer (the digital terminals at all positions in the warehouse have more or less the same equipment). The work procedure in the warehouse is: when materiel are to be received or dispatched, an automatic cargo-handling truck loads the cargo onto itself, and its operator notifies the central processor, via the keyboard, of the packing box number. The processor's instructions, which come up on the display screen, tell the storage point what every piece of cargo is and the position, variety, and quantity of materiel to be handled. Based on its instructions, the microcomputer on the cargo-handling truck is responsible for arranging the movement of the truck and the sequence in accessing the cargo. After the cargo is dispatched (or received), the printer on the truck makes checks and prints out the receipt and order documents, after which it sticks them on the cargo. If the variety does not tally, the central processor notifies the cargo-handling truck to make a correction, after which the cargo is either

received or dispatched. Only a few persons are needed to manage a warehouse that stocks more than a million pieces of materiel, and each shift can handle 1,200 to 1,600 orders, with an efficiency rate several hundred times higher than that of manual operations.

Materiel management on the battlefield has been modernized. At well-sited storage points, selected with survey instruments, long-range infrared laser composite cameras and night-vision devices display clearly the terrain and features of the battlefields at the army, division, regiment, and company levels. Based on reports on the enemy's situation, our army's mission, and battlefield forecasts, a micro-electronic pen draws storage maps for battlefield materiel on different scales. Based on different geographical conditions, different developments on the battlefield, and the roads going in and out of it, the maps also display different advance storage plans for selection. Clerical and ordnance personnel at all levels can, by using microcomputers, report at any time statistics on the consumption of various kinds of materiel to the battlefield materiel management centers of armies and divisions. Based on the materiel consumption on the battlefield and on the units' next mission, a management center formulates the optimum replenishment plan. Thus the needs of food, clothing, necessities, and combat are insured but not excessively so.

In battlefield materiel management, there is also the problem of protection. In addition to the protection afforded to the materiel themselves by armor or composite armor, there are color camouflage nets that are the same color as the ground and antilaser photographic reconnaissance protective layers. There is a field protective packing device that uses a packing method of a completely sealed cocoon type. Like the spring silkworm it makes a cocoon that completely seals the materiel or equipment so that nothing is exposed, forming a hermetically sealed protective cover. Inside the cover is a dehumidifier that dehumidifies or makes a vacuum. Not only does this insure that there is no damage to materiel or equipment that is transported a long distance, it also protects against humidity, mildew, and corrosion. Even if left outdoors for several years, the materiel or equipment in it will not go bad and there is no need for a special warehouse.

C. Timely, Accurate Supply of Materiel

Modern warfare depends on the timely, accurate supply of materiel. Thus the materiel must be sent on schedule, and the variety, quantity, and places must be accurate. The specific requirements for this are:

1. A Timely Grasp of the Kinds, Quantity, Places, and Opportune Moments for Materiel Supply. This requires the timely application of electronic computers and of laser, infrared, and remote-sensing technologies, as well as television, telegraph, and other telecommunication equipment to grasp timely and accurately the situation on every battlefield and the consumption and storage of each kind of materiel. Then the optimum time, place, kind, and quantity for replenishment is calculated, after which instructions are issued.

2. Rapid, Accurate Allotment of Materiel. After each department concerned receives instructions for the allotment of materiel, it immediately, through the electronic computer and various modernized means, timely and accurately selects the supply warehouses and issues the allotment instructions to them. After receiving the instructions, the warehouses rapidly and accurately move the needed materiel to truck-loading sites. With modernized equipment it only takes about 10 minutes to complete all these processes, which, if they depended on manual work, it would be hard to say how long they would take. In past wars, 8 hours were spent on finding in what warehouse one kind of materiel was stored, and this is something not permitted in modern warfare.

3. Rapid Delivery to Front. First the optimum line for delivery to the front is selected. Through a comprehensive summing up of information by a computer, the optimum plan is formulated. Then modernized means of communication are used to notify a truck transport regiment that possesses a high capacity for cross-country transport, and the materiel are rapidly delivered to the front. If the materiel are urgently needed, a helicopter transport dadui can be mobilized; if the equipment is large, strategic transport aircraft and fast airships can be mobilized to transport it nonstop. The various means of transport, such as railway, waterway, highway, airlift, and pipeline, are coordinated to do intense work, not only insuring accuracy in site but also in time.

The materiel support of the Navy and the Air Force is not too different from that of other service arms, but there is an increased supply of special items, such as water, POL, oxygen, electricity, and air (compressed air). Thus, special equipment is needed, such as tank-ships, water ships, guided missile supply ships, ammunition ships, and materiel supply ships; refueling aircraft, refueling trucks, battery-charging trucks, machine-starting trucks; as well as ships that supply purified fresh water.

III. Highly Efficient, Top-Grade Medical Services Support

A. Medical Services Command Centers Have Been Automated

Medical services command is extremely complex and arduous. Not only does it touch upon a wide area, such as military affairs, geography, and climate, but also it required a lot of computed data. No matter whether it is estimates of depletion in numbers of personnel for medical reasons, allocation of transport forces, or deployment of personnel, a large amount of time and manpower must be spent in making mathematical calculations and analyses. The slightest oversight will adversely affect the accuracy and rapidity of command. Therefore, there must be set up in the war zone and the rear electronically controlled medical services automated command systems, which will maintain a relationship of timely, accurate exchange of information with military command departments and logistics command departments, so that there is a high degree of unity in medical services command.

According to the nature and procedures of their work, medical services automated command system can be divided into six large control systems: 1. A battlefield casualties monitoring system. It is responsible for collecting information on the number of battlefield casualties and the steps in the

treatment of wounded personnel. It gets information about the units' missions and the changes in the military forces and weapons of the enemy and its side in order to understand the work situation with respect to the support needs and the treatment and care structure of forward units. 2. A system for analyzing and estimating the depletion in number of personnel. It scientifically analyzes the proportion of casualties, wound conditions and wound types and the casualty-producing factors. It examines the medical services support plan to see whether it suits the current mode of operations, and estimates the number of personnel who could be depleted in the next step. 3. A system for observing special situation. It timely informs the command center of the scale on which the enemy is using nuclear, chemical, and biological weapons, the types of weapons used, the degree of casualties and contamination, the geographical and climatic conditions, and the losses suffered by units. 4. A system for allocating forces that provide treatment. Based on the instructions from the military and logistics departments concerned, and referring to data provided by each system, it formulates the optimum plan and basis for deploying the organizations that send personnel to the rear for treatment and for readjusting the transportation lines. 5. A system for storing data. It sorts out and numbers various types of data and the results of processing them to provide a basis for the formulation of medical services support plans and for the summing up of experiences in medical services support. 6. A system for communications and liaison. It is responsible for transmitting instructions timely, accurately, and reliably. With the aid of highly sensitive antijamming devices, it insures that medical services command is not cut off.

The work processes of a modernized medical services command center are basically automated. With the flashing of red lights and the ringing of alarm bells, there is immediately displayed on the operations map special symbols showing the enemy's use of nuclear weapons against its side. For example, line after line of data giving the nuclear attack coordinate points, the number of nuclear bombs, the explosion patterns, the equivalent weights, the wind directions, the wind speeds, the military forces at the point of attack, the presence or absence of defense works, and the depletion in numbers of personnel due to medical causes are clearly flashed on fluorescent screens.

Soon afterward, one instruction after another is sent through the dense communication network to the forward first-aid stations, nuclear wounded rescue teams, and medical helicopter dispatch centers.

The automation of medical services command greatly reduces the personnel establishment and raises work efficiency by 40 percent. In this way, the time for formulating the support plan can be shortened and its accuracy and reliability can be increased, so that medical services command can keep up with the fast-changing developments in the war situation.

B. High-Quality, Highly Efficient Medical Treatment

Modernized treatment organizations are deployed all over the war zone. First-aid stations, field hospitals, training hospitals, rear hospitals, local front-support hospitals, and ground, air, and sea evacuation systems criss-cross the war zone and are mutually linked. From the tactical range and the

campaign depth, they extend to the strategic rear, forming a complete series of battlefield medical treatment networks. At the same time, the medical organizations are equipped with the most advanced communications and liaison equipment and means of evacuation, which enable them accurately and efficiently to treat and evacuate wounded personnel. Besides being equipped with advanced instruments and equipment for medical treatment, the various kinds of first-aid teams are provided with tracked armored ambulances and medical helicopters, which at any time can carry out "three defenses" first-aid missions and support the changing directions of battle.

Every combatant carries an individual first-aid pack for stopping bleeding, reducing pain, preventing radiation injuries, and preventing injuries by chemical toxicants. A combat medic carries a first-aid surgical kit weighing about 0.5 kilogram. He rides in an armored ambulance and rapidly and safely rescues wounded personnel from complex and dangerous situations. By using electronic instruments the hospitals at all levels not only are able to classify wounded personnel, screening the nuclear wounded personnel and the conventionally wounded personnel, but also are able to indicate the seriousness of a wound, the degree of infection, and whether the internal organs are injured and whether there are signs of shock. Afterward, instructions are given to send them to various treatment rooms. During the process of giving first-aid, besides making use of instruments to protect the heart, instruments that make diagnoses with miniature ultrasonic waves, and security systems that report on the patient's condition, which closely observe the wound condition and timely dispel shock factors, the medical personnel make use of instruments that dispel heart tremors, instruments that stimulate the respiratory center, whole-blood substitutes, and various kinds of new emergency treatment drugs to snatch the wounded personnel from the jaws of death.

In a future war, it is highly likely that the enemy will use nuclear, biological, and chemical weapons. To reduce effectively the harm done to personnel by these weapons, besides having personnel wear protective clothing, we will have them take various drugs and vaccines in advance, either orally or by injection, to increase the number of antibodies in their bodies and thus reduce casualties and illnesses.

In addition, when a large-scale war breaks out, the battlefield will be vast. The doctors and nurses must have a fairly high capacity to adapt. No matter whether it is an area in the frigid zone, tropical zone, alpine zone, or desert zone, they must adapt as fast as possible to the changes in environment and temperature before they can insure that their medical treatment is of high quality and high efficiency.

C. Portable Sets of Hospital Instruments and Equipment

There are many kinds of equipment in a modern field hospital. Some of these hospitals are composed of collapsible, box-type movable buildings and air-filled tents. A 2.5-ton truck can transport two air-filled tents, and each tent can take in 20 wounded personnel. Other hospitals are made of glass fiber-strengthened plastic or aluminum plastic. They have a light but strong structure, and it takes only 4 hours to set up one of them. All of these

hospitals have an operating room, outpatient room, laboratory, X-ray room, antishock room, wards, work units, and management systems. They have facilities to supply electricity, water, oxygen, and blood and to regulate the environment. They also have perfected protective devices and advanced communication equipment. Their work procedures are integrated, they are highly mobile, and they can be swiftly shifted within the war zone. Also, they are not affected by climate or geography, and are able under conditions of field warfare to provide treatment that approximates that of field hospitals in the rear.

The containerized structure of their medical equipment, medical instruments, and medicines is extremely ingenious. Based on different requirements, they can be packed into complete sets suitable for various forms of transport. They can also be automatically or manually transported under field conditions and adverse circumstances. Functioning as complete sets, complete lines of equipment for supplying electricity and water and for regulating temperature can be installed, which possess the excellent specific properties of resisting cold, heat, and wear and of being insulated and sealed. Not only can they be transported in containers, but also, after being set up, they form a work unit.

The kinds of medical instruments and equipment are standardized. They are light in weight and small in bulk, which makes them convenient to carry, use, and supply. There is a complete variety in the sets of medicine. The operating table, appliance cabinet (stand), sickbed, and medicine box (cabinet) can all be taken apart and put back together, and they have many uses. The structure of the equipment for supplying blood, disinfecting, warming, illuminating, replacing fluids, destroying bacteria, regulating water, and making chemical tests is simple, convenient to use, highly efficacious, and easy to transport.

D. Rapid, Safe Evacuation of Wounded Personnel

The surface means of evacuating wounded personnel have great motive power and strong cross-country performance. There are armored tracked devices and amphibious devices that can be driven under all sorts of adverse weather conditions and that, in complex terrain, can search for, carry, and evacuate wounded personnel. Inside each vehicle there is equipment for air conditioning and heating, air-filled stretchers, and fixed-position appliances. The vehicle is fast and has little vibration, so the pain of the wounded personnel is reduced and an aggravation of their wounds is avoided. The medical equipment inside the vehicle is complete. There are first-aid instruments and operating appliances. There is also equipment for making infusions, giving blood transfusions, supplying oxygen, detoxicating, and controlling nuclear radiation damage. During the evacuation, measures against shock can be taken, and special nursing can be provided. The armored tracked ambulance is highly mobile. It can closely follow the advance of units on the battlefield and at any time pick up wounded personnel. An ambulance train has a large carrying capacity, and at one time can evacuate several hundred to a thousand wounded personnel.

The helicopter is the main means of evacuating wounded personnel by air. A helicopter used for battlefield and short-distance evacuation is equipped with good first-aid equipment and even an artificial heart, and is able to provide hospital-type emergency treatment. In a war zone that has complex terrain, amphibious helicopters are responsible for searching for and evacuating wounded personnel. Large transport aircraft are responsible for the long-distance evacuation of wounded personnel. One transport aircraft can carry up to a hundred wounded personnel on stretchers, and can take off and land on dirt runways.

Most means of evacuating wounded personnel by sea are amphibious craft. A hovercraft can land on a beach at a speed of 55 kilometers per hour, and is responsible for the work of searching the beach and sea for wounded personnel and rescuing them. There is also a hovercraft ambulance boat that is specially used for transporting wounded personnel between islands. It has a speed of 103 kilometers per hour, and in one voyage can carry four stretcher wounded and eight standing wounded. In addition, there is the large hospital ship that plies the ocean. It can be equipped with 1,000 berths, and can both give battlefield emergency treatment and act as a means of evacuating wounded personnel.

During an evacuation, electronic computers and other advanced equipment make a register of the wounded personnel, arrange treatment papers, prepare the necessary items for nursing on the way, link up with various stations on the way, and notify the receiving hospitals to make good preparations. Schedule display systems give timely instructions on the way on the procedures for passing on and handing over wounded personnel, so that they swiftly arrive at the designated hospitals.

IV. Communication and Transportation Lines Extending in All Directions

A modern war is usually fought simultaneously on land, at sea, and in the air. If units want to launch operations in jungles, mountains, lakes, and seas, one form of transportation is inadequate for completing a mission and various forms of transportation must complement each other, organically combining the five big forms of transportation (rail, road, water, air, and pipeline). With priority given to the main lines of supply, the connected or simultaneously used lines of communication form a criss-crossing communication and transportation network that extends in all directions.

A. Criss-Crossing Communication Network

1. Rail Transportation. Rail transportation is a major component part of national defense. Like the arteries in a human body, it has the largest rate of flow, and therefore people by analogy call it the "major artery" of communication and transportation. To achieve the modernization of rail transportation, it is necessary to combine into an organic whole the army and the people, peacetime and wartime, and this means closely combining the demands made on railways by national defense and the national economy. The principal goals of modernization are: connecting the railways into networks, electrifying traction, and modernizing management.

Connecting the railways into networks means spreading the rail lines to every place, so that they have a high capacity for passage. These networks of lines can insure that units and operational materiel are timely conveyed to the operational area, or that units are rapidly deployed from one direction to another. With the "networks" there must also be "key links." That is to say, in the main direction of operations there needs to be a high-speed rail trunk line to give impetus to the entire network. In peacetime, the headquarters and military traffic departments in the war zone, by means of a management and control system set up by the railway bureaus, are in charge of special military vehicles, make plans for military transport and mobilization, and coordinate military and civil transportation. Once war breaks out, automated trains, like long dragons, can race to each battlefield as swift as the wind and as quick as lightning.

2. Road Transportation. If we say that railways are like the "major arteries" in a human body, the roads are like the "small blood vessels" spread throughout the body. They pass straight to the "forward position" of every location. In modern warfare, highways not only connect the strategic and campaign rears but also every tactical region. Therefore, modern road transportation must first be formed into a comprehensive strategic and campaign-oriented nationwide highway network that is rationally laid out and that combines trunk and branch highways.

To meet the needs of warfare, high-speed, multipurpose military vehicles must be used for road transportation. These vehicles are convenient for strategic and tactical movement, are easy to repair and maintain, and possess a fairly high degree of interchangeability and a good technical performance. Their carrying capacity is high, loading volume large, protective capability strong, and cross-country performance good. They come in four model series: light, medium, heavy, and lifting. Some of these vehicles can ford deep water and can be used on both water and land. Some of them, besides being used for transport, can, after a little refitting, be used for reconnaissance and command or act as antitank carrier vehicles. The medium cross-country vehicle with which battalions, regiments, and divisions are equipped has a loading capacity of about seven tons. A motorized infantry division has more than 300 transport vehicles and about 280 trailers of various kinds. Its transport capacity should reach about 1,500 tons.

3. Water Transportation. Water transportation is divided into sea transportation and inland waterway transportation. Their basic forms of transportation are: container, fluid, top propulsion, and direct river-to-ocean transport. The trend in the development of military transport ships is to make them big, fast, and automated. Currently the loading capacity of the largest seagoing oil tanker is 740,000 tons, and the maximum speed of a container ship is 33 knots.

To meet the needs of modern amphibious operations, many countries have equipped their units with hovercraft. A hovercraft is fast, and it has a long range and a large loading capacity. Not only can it be used on both water and land, and is able at high speed to cross swamps, ice and snow, and deserts--regions that are hard for ordinary vehicles and ships to cross--but also it is very difficult for a hovercraft to be damaged by underwater obstacles,

underwater weapons, and land mines. It is an ideal, new-type operational transport ship.

4. Air Transportation. One of the characteristics of modernized armed forces logistics is air transportation. In modern warfare it occupies a very important position. Logistical air transportation is suited for the strategic scale and also for the campaign and tactical scales. It can be used both for materiel support and for technical and medical support. The main indication of the modernization of air transportation is advanced means of transport. Besides aircraft and helicopters, there are air-cushion vehicles, balloons, and airships. The second indication is the distribution of airfields in various places and the mechanization of loading and unloading, the standardization of materiel packaging, and the automation of command.

5. Pipeline Transportation. This is the best way for transporting POL. It possesses the characteristics of stable equilibrium and dependable safety. It is little affected by climate and environment, and is advantageous for operations. One pipeline with a diameter of 1,200 millimeters can convey 42.95 million tons of petroleum a year. It is thus obvious that the transport capacity of pipelines is very large. During World War II, in certain campaigns conducted by the Allied armies, about 70 percent of the petroleum was supplied via pipelines. When the German Army was besieging Leningrad, the Soviet Army laid an oil pipeline through Lake Ladoga, and thereby insured the needs of that city for POL. Besides oil pipelines there are coal pipelines and natural gas pipelines. Modern pipeline equipment not only is easy to lay and remove, and can be swiftly shifted, but also is highly efficient in supplying oil. Even in undulating terrain, a pipeline can convey 350 gallons of POL a minute. Pipeline transportation should also be formed into a nationwide network. A field pipeline must be light-duty and manufactured to type, and be capable of automatic control, automatic delivery, and automatic refueling. In this way it will be able to meet the special needs of modern warfare for POL.

B. System for Effecting Unified, Highly Efficient Command

In modern warfare, communication and transportation are extremely arduous and complex. There are many departments involved, the scope of activities is vast, and a high degree of professionalism is required. Therefore, there must be a special system for effecting command, so that there is vigorous organization and command. A command system is formed from the highest command post down to each war zone. In peacetime, it makes preparations throughout the country and in the war zones for wartime work in communication and transportation. In wartime, it exercise unified command over communication and transportation departments (rail, water, road, air, and pipeline transportation departments, and the relevant departments of each service arm and the communication and transportation headquarters in each war zone and in each campaign direction). Thus, rail, water, road, air, and pipeline transportation each displays its strong points, many routes are developed simultaneously, and they complement each other. This makes military, government, and civil transportation coordinate in unison; makes transportation, rush-repairs, and protection integrate closely; and makes all kinds of transportation forces throughout the country, throughout the army,

and in the war zones and at the provincial level form an organic whole that provides powerful support for military operations.

The automatic command system for transportation in a headquarters or war zone is equipped with a computing center that has electronic computers as its core. In them are various kinds of information libraries that store information on the position and state of every means of transportation (railway cars, locomotives, trains, ships, and so forth). This information can be displayed on fluorescent screens. All kinds of data are recorded, arranged, and processed, as is the movement of the means of transportation. Through this center the command organizations are rapidly made cognizant of the transportation situation and the rate of utilizing the means of transportation, so that they can send commands.

C. Transportation Lines That Cannot Be Blown Up

1. Powerful Road-Protection Forces. In wartime, besides specially organizing road-protection units (fendui) and providing special protection for key lines, junction stations, bridges, tunnels, ports, and airfields, on each communication line there is an antiaircraft fire net composed of railway corps, engineer corps, Air Force, guided missile, and antiaircraft artillery units, and of militia, which can deliver powerful blows to the enemy.

2. Highly Mechanized Road Maintenance Contingent. This contingent is composed of members of the railway corps, road construction corps, engineer corps, and airfield construction corps. These special service arms have the capability for high-speed mechanized operations. The road construction unit of a group army can build a road nearly 100 kilometers long within a few days. A road construction unit is equipped with some special-use machines and with reconnaissance instruments, minesweepers, excavators, and other equipment for removing obstacles and opening up routes for follow-up units. When cleaning up the aftermath of an atomic attack, as well as when laying roads in areas hit by an atomic attack, much use is made of bulldozers, road graders, scrapers, and other construction machinery to eradicate soil contaminated by radioactivity so that radiation is lowered to a safe level.

3. Strong Communication Engineering Facilities. Communication facilities must have a very high capacity to resist damage: First, a large junction station has detour lines, satellite stations, and multitrack bridges. It also has reserve ports, railway stations, ferries, and loading and unloading zones, as well as railway car- and ship-building bases. Second, facilities are concealed by camouflage and put underground. There are camouflaged bridges, ferries, and railway station, and also dummy ones; underground command posts; cave-type railway cars; ship overhaul bases; and concealed caves for locomotives. Third, the facilities are reinforced. Measures have been taken to reinforce bridges, bridge piers, reservoirs, river dykes, and locks and dams, so that they are blast-, shock-, and flood-resistant.

4. Various Means for Effecting Fast Repairs and Fast Passage. Various measures must be taken for rush-repair in wartime, so as to race against time, strive for speed, do everything possible to shorten the time that a communication line is cut, and strive to keep lines open to traffic for longer

times. The main measures are: First, giving priority to keeping lines open rather than to perfecting them. Under the premise of insuring safety, the technical standards for rush repairs can be comparatively low, giving priority to keeping lines open to traffic so as to insure the supply of materiel urgently needed. Afterward, facilities can be perfected. Second, having many bridges, many routes, and many crossing points. In the enemy's key blockading zones, there should be detour roads, detour bridges, and many river-crossing points, so as to disperse the enemy's forces and make him attend to one thing and lose sight of another, so that when one line is cut another is opened. This is an effective method for breaking an enemy blockade. When a river obstacle is encountered, modernized bridge-laying equipment of a lightweight aluminum alloy structure is used to throw a large-span heavy load-carrying bridge across the river. The bridge is automatically erected and retracted. When a swampy or muddy road is encountered, or when a road has been blown up, a "tracked road" can be laid. The equipment for it is made by extruding thick aluminum alloy plates, or sometimes the equipment is made of glass fiber-strengthened plastic, which makes the road firm for truck and trailer transportation, depending on the kind of road that needs to be laid.

V. Rapid, Diversified Battlefield Rush-Repairs

Advanced maintenance equipment is complemented by modernized rush-repair methods, which can within a very short time repair damaged weapons and equipment, causing damaged warships to continue to ride the winds and cleave the waves, causing damaged tanks, trucks, and armored cars to resume their rush forward, causing damaged aircraft to fly again, and causing damaged artillery pieces and machineguns to roar and chatter again....

A. Integrated Repair Network

In their maintenance systems, the armed forces have layer upon layer of modernized repair contingents. In the localities there are powerful maintenance forces, with integrated military-civilian support, forming a network from top to bottom and on all sides. No matter whether the enemy comes from air or sea, no matter whether the battle is fought at the front or in the rear, wherever there is a battle there will be repair forces, and wherever there is damage to weapons and equipment immediate repairs will be made.

In the armed forces there is formed, from top to bottom, an integrated maintenance system. The company has a maintenance squad, the battalion a maintenance platoon, the regiment a repair station, the division a repair battalion, the army a technical maintenance center, and the rear maintenance bases. In wartime, "battlefield basic-level maintenance" is performed by the company, battalion, and regiment, which are responsible for the inspection, adjustment, repair, and replacement of small parts. "Battlefield support maintenance" is performed by the division, which is responsible for the repair and replacement of spare parts and their assembly, and it dispatches technical forces to support basic-level rush-repairs on the battlefield. The army is responsible for "overall support and maintenance." It carries out major overhauls and reconditioning of complete sets of equipment, supports rush-repairs in the main operational direction and on the battlefield, and provides

technical support to the war zone of the highest level. "Rear maintenance" is mainly performed by rear bases, which are responsible for the thorough rebuilding and remaking of equipment that is unable to be repaired in the war zone.

There are abundant repair forces in the localities and fairly many repair organizations. They closely coordinate with the maintenance organizations at all levels in the armed forces in performing maintenance to insure that the needs of war are provided.

B. Perfected Complete Sets of Maintenance Equipment

There are many weapons and pieces of equipment in modern warfare. Damaged weapons and equipment are rush-repaired on the battlefield by the various kinds of field repair stations accompanying the units. The field repair stations that usually appear on the battlefield are: field motor vehicle repair stations, field ordnance repair stations, field tank repair stations, and ship-repair ships. These field repair stations are composed of engineering vehicles with many different uses. For example, a comprehensive repair plant on the battlefield not only has a full range of maintenance equipment but also complete sets of them. It is suited for making battlefield rush-repairs under conditions of sea, air, and land combat, and is also able to make battlefield rush-repairs on all kinds of weapons and equipment or on several weapons and pieces of equipment at the same time.

The various kinds of field repair engineering vehicles that comprise a field repair station are equipped with tools and equipment that can be assembled and disassembled, machine-processing tools, cold- and hot-shaping tools, measuring and testing tools, tools for regulating and repairing gasoline engines and diesel engines, hydraulic return-circuit and electric systems, and other equipment and devices. These pieces of equipment and devices can check and repair weapons, tanks and armored vehicles, radio communication equipment, and other equipment of units. The various kinds of engineering vehicles at a repair station are equipped with weapons, so that they can both carry out rush-repairs and take part in certain forms of combat.

Under circumstances in which combat units are far from the big rear and far from big units, because their repair equipment and technical forces are limited, and also because communication is not easy, rush-repairs on the battlefield are difficult. The helicopter that at this time is charged with the task of making rush-repairs. after receiving its orders, is immediately loaded with special technicians, and it carries a hoist-type container filled with various kinds of maintenance tools and spare parts. It flies directly to the place where it has been ordered to make rush-repairs and swiftly regenerate damaged weapons and equipment on the spot.

The more science and technology develop, the more complicated weapons and equipment become. At the beginning of the 1950's, there were only 500 to 1,000 checkpoints in a weapon and equipment system. By the end of this century, there will be 100,000 checkpoints in a principal weapon and equipment system. To adapt to this situation, fault-checking instruments are being rapidly developed. The "programmed fault detector" is representative of these

instruments. This detector is an electronic microcomputer, which, in accordance with a preset program, checks out a series of items. Within a few seconds it can display the results of its checks on its panel or print out the results. It is able to make a logical judgment and determine the cause and position of the fault. It is also able to tell the repair personnel how to carry out a rush-repair. To a very large degree it replaces the human. It only takes a few minutes to detect and repair an ordinary fault, and there are no errors. There is also a "comprehensive standardized automatic detection system," which can check out many kinds of weapon and equipment systems. Like a doctor with a stethoscope, it can diagnose faults in the systems. It is convenient to use and accurate, and is an effective piece of equipment for increasing the speed of a battlefield rush-repair.

C. Flexible, Varied Methods of Rush-Repair

There are a myriad changes on a battlefield, and the methods of rush-repair are also diverse and varied.

1. Parts Repairs. If the damaged part in a weapon or piece of equipment is repaired, not only will time and effort have been spent, but also the opportunity for combat could have been lost. If the damaged part is taken out and replaced by a new part, the weapon or system can be swiftly regenerated. To expand the scope of part-changing repair, when designing and manufacturing the weapon or piece of equipment, the kinds and types of parts should be reduced in number as much as possible, so that they are standardized and interchangeable. That is to say, one part can be used in several different weapons or pieces of equipment. For example, a certain part in a light machinegun can be used in a heavy machinegun, a submachinegun, an automatic rifle, and even a cannon. With this part rush-repairs can be made on these weapons.

In some weapons and pieces of equipment, the technology is complex. They have various tiny parts and are fist-size in bulk. There can be as many as a hundred parts. Even part-changing repair requires a lot of time and effort, and is over elaborate and trivial. This requires that, when the weapon or piece of equipment is manufactured, it be made as a complete module, forming several dozens and even a hundred tiny parts into a whole. When damaged the whole module is repaired by exchanging it.

2. Disassembly Repairs. Under circumstances in which a weapon or piece of equipment has suffered a lot of damage, and for a time the parts needed to repair it cannot be supplied, an effective method is to flexibly carry out repairs by disassembling. For example, one or two of many damaged tanks are disassembled and their parts that are in good condition are used to swiftly rush-repair several other tanks, making them again fit for battle; or captured damaged equipment is disassembled and repaired for our use.

3. Technical Guidance. Because their technical forces are limited, and also because they are far from repair bases, units holding fast on border defense or stationed in remote mountain areas are often unable to solve some knotty problems that they encounter. After television and videorecorder technology was applied to the work of making rush-repairs on the battlefield, when there

is a knotty problem the situation can be reported by television to a technical center, and instructions requested for ways to solve it; or a detailed report on the damage to a piece of equipment can be videorecorded and sent to a technical center in the rear.

4. Fast Supply and Evacuation. Although a large number of maintenance parts are stored in a war zone, sometimes they either don't meet the actual needs of combat units or are insufficient. In this case the units must depend on fast supply from the rear. The main form of this supply is by air, by means of which the maintenance parts urgently needed by the units can be directly supplied rapidly, accurately, and geared to their needs. Within a short time, weapons and equipment that cannot be repaired can be rapidly transported, by air or surface means, back to the rear for rush-repair.

With the development by leaps and bounds of science and technology, weapons and equipment are constantly being renewed. The more the armed forces are modernized, the more clearly is shown the important position and role of logistics in warfare.

Chapter 12: Modern Engineering Support

Engineering support is an important component part of campaign and battle support. Its important parts are: conducting engineering reconnaissance, constructing field works, building roads, laying bridges, opening crossing sites, reconnoitering water sources and building water stations; placing and removing obstacles and conducting destruction operations; and making camouflage and doing engineering work to remove the consequences of nuclear attacks. Through these engineering measures, it preserves the effective strength of the armed forces and the war potential of the country, and insures command stability and high-speed mobility. At the same time it creates difficulties for the enemy's operational actions and proceeds to the next step of creating advantageous conditions for wiping out the enemy.

Turning over the pages in the history of war, one clearly sees that engineering support has a direct relationship on the course of a war and on victory or defeat in it. In the initial stage of World War II, the Soviet Union was paralyzed by the "Soviet-German Mutual Nonaggression Pact," and it lacked mental and material preparations against Hitler's sudden attack. Under the circumstances in which Germany stationed 5 million [as published] troops on the Soviet border to form a half moon-shaped encirclement of the Soviet Union, the latter had not yet completed its national defense projects on its western border. On the in-depth battlefield, the construction of protective field works, road networks, airfields, and bases was also far from perfected. On the first day that Hitler tore up the pact and suddenly mounted a large-scale invasion, the Soviet armed forces lost more than 1,200 aircraft, four-fifths of the total number of their frontline aircraft. At the same time, the defensive positions and road networks, the communication and liaison system and the command system, all suffered serious damage. The German Army swiftly broke through the first defense line, and in about a dozen days had invaded Soviet territory to a depth of 200 to 400 kilometers, thereby completing its strategic breakthrough mission. It pressed on up to Moscow, putting the Soviet Army in an extremely passive position.

The bitter lessons of the initial stage of the war made the Soviet Army attach extreme importance to engineering support in campaigns and battles. Before the battle to defend Stalingrad, it built four defense lines with a total length of more than 2,800 kilometers. During the battle, it mobilized a large number of army-people rush-repair tools, roads, and ferries, deployed obstacles, and powerfully beat back the frenzied attack of the 1.5 million-strong German army. In its first encirclement it bagged more than 300,000 German troops and wiped them all out, causing the war situation to take a sudden turn and develop rapidly as the Soviet Army began a strategic counterattack.

A future war will probably be a three-dimensional war fought, either simultaneously or in turn, on land, sea, and air, and underground and in outer space. Because of the constant development of weapons and equipment, the struggle between surprise attacks and measures against surprise attacks, between sabotage and measures against sabotage, and between mobility and measures against mobility will be incomparable to that of past wars. Therefore, the vast scope of engineering support, the large amount of its

operations, the good quality required of it, the complex engineering techniques, and the short time required to complete tasks will be unprecedented. This demands that the engineer corps and the railway corps give full play to the role of technical backbone elements when carrying out engineering support tasks. It demands that all branches and arms of the service strive to improve their capability for self-support, and at the same time that all people in the country be mobilized to take an active part in the construction of national defense projects and civil defense projects and to fight a big people's war of engineering support.

I. Strong Protective Engineering

The experience of war tells people that if they want to reliably preserve the effective strength of their armed forces and the war potential of their country, they must set up a large in-depth protective engineering system, with national defense projects as its main part and with permanent defense works as its backbone, which closely combines field defense works with civil defense works. In this way, the protection of the front and the protection of the rear can both be insured, the protection of the armed forces and the protection of the masses can both be insured, the protection of personnel and the protection of the principal industrial facilities and bases that support the war, as well as materiel, can both be insured.

A. Strong, Perfected Permanent Defense Works

Permanent defense works are defense works of a permanent nature that, before war comes, have been set up and built with strong structures and perfected equipment. They are the backbone of national defense projects. Because in modern warfare nuclear, chemical, and biological weapons will be used, there will be casualties and destruction on an unprecedented scale. Even if only conventional weapons are used, their casualty-producing effect has greatly increased over that of the past. For example, new ideas in the technique of manufacturing projectile heads have increased their capability of piercing targets such as armor and reinforced concrete by 10 times. With the appearance of air-burning explosives, when such an explosive is set off it not only produces a powerful shock wave, but also, within a certain range, creates an extreme shortage of oxygen and high temperatures that suffocate personnel, stop machinery, and damage equipment. The improvement of guidance technology has greatly increased the target-hitting accuracy of weapons. Therefore, in building defense works, not only must fighting against infantry be taken into account but also fighting against tanks, aircraft, and airborne forces must be taken into account. Not only must the works be able to defend against artillery shells and bombs, but also they must be able to defend against atomic, chemical, and biological weapons. A single defense work should have a fairly strong protective capacity and many uses. The defense works must be linked up to form a whole, so that the positions possess perfected works for firing, taking cover, observing, and commanding in order to insure that the troops are able to fight, conceal themselves, live, and move about, and also be able to hold the positions for a long time.

Following the development of weapons and equipment, defense works have gradually been moved from above ground to below ground. Before World War II,

most of the permanent defense works built by countries were built like houses. First, the ground was broken and a hole dug. Then a foundation was laid and a blockhouse built. The protective capacity of this kind of defense work is fairly poor compared to that of an underground defense work. For example, when a nuclear bomb explodes, defense works on the surface at the same distances from the center of the explosion's projection points are completely destroyed. But underground tunnel defense works, which make use of the natural layers of the earth for a protective layer and which are dug to a depth of 10 to 13.5 meters, remain in good condition. The electronic instruments in the tunnel work normally, and test animals in them escape unscathed. Experiments have proved that when a nuclear bomb of 1 million-ton equivalence is exploded in the air, if all personnel within 3 kilometers of the center of the explosion are in light defense works, the number of deaths is reduced by more than 84 percent. According to data briefings abroad, a defense work with a 50 centimeter-thick concrete cover or and 80 centimeter-thick damp-earth cover can reduce the casualties caused by a neutron bomb's penetrating radiation by 90 percent. Therefore, in addition to the firing and observation defense works, the other kinds of defense works should, as much as possible, be built underground, so as to form an impregnable underground bulwark.

Based on the requirements for permanent defense works, a tunnel defense work should generally be no less than 20 meters underground. Its entrance is fitted with a protective door that can withstand an explosion shock wave of several to several dozens of atmospheres, and an airtight door that completely cuts the defense work off from the outside world in order to prevent an explosion's shock wave, poison gas, biological agents, or radioactive contamination from getting into the defense work. The interior of the defense work is fitted with perfected ventilation, filtration, dehumidification, moistureproof, antiseismic, and other equipment to support combat and life. Take, for example, the North American Air-Defense Headquarters. It was built in a rock stratum 450 meters underground, and nearly a thousand powerful springs prop up the workrooms in it, greatly improving its protective capacity.

A currently popular saying in Europe is: "The atomic era is the underground era." Not only are the ground protective defense works of armies being put underground, but also the air forces and navies have built underground hangers and underground naval bases (like the underground naval base at (Musi) Island in Sweden).

To meet the needs of large-scale underground project construction, many countries are constantly exploring new tunneling techniques in machinery, chemistry, and electronics. Beginning in the 1950's, there was a break from the traditional tunneling method of drilling and blasting when the whole-rock section tunneling method appeared. This method of tunneling is able to pierce straight through a solid rock stratum. Every day a tunnel several dozen meters long with a span of several to a dozen meters can be dug. The tunneling rate is several times to several dozens of times faster than that of the demolition method. America has come up by research with a softening agent that, when sprayed on rock at the tunneling face, reduces its hardness by 50 percent, thereby greatly accelerating the rate of mechanized tunneling. Advanced electronic technology is not only being widely applied in the

automatic control of underground construction, but also is being directly used to cut rock by means of high-density electron beam techniques. When a high-density electron beam is trained on a tunneling face, the rock expands, breaks, and peels off. The combine tunneler, in which a new technology is used in its manufacture, is not only highly efficient but also safer.

The development of technology in the construction of permanent defense works has created conditions for setting up a large in-depth, high-strength natural defense engineering system. At present, the point style of erecting a defense based on isolated fortifications, or only building a continuous zone of ramparts along the national boundary line, cannot hold back an large in-depth offensive by a million troops on a broad operational front. Therefore, all countries are putting stress on increasing their defenses in depth and on setting up a ring-shaped three-dimensional defense system composed of many zones in great depth and of high strength. The depth of each defense zone is several dozens of kilometers. At the same time, at those strategic points that the enemy must take and we must defend, fortifications are set up that can be held for a long time. The defense works are put underground, defenses are made into strongholds, and the places where troops are stationed are made into battlefields, so that they become the mainstays for the entire defense system. In this way, point, line, and area are combined to form a whole protective system on the national territory.

B. Rapidly Constructed Field Works

In the course of modern warfare, there have been rapid developments and changes. Although many permanent defense works have been built in peacetime, they cannot completely satisfy wartime requirements. Therefore, no matter whether it is fortified position defense or field position defense, there needs to be constantly built, just before battle or during battle, bunkers, shelters, slit trenches, pits (foxholes), trenches, and communication trenches. Although these field defense works are simple and crude, they have an important protective effect. When the enemy makes a surprise attack with firepower, they greatly reduce casualties.

During the war to resist U.S. aggression and aid Korea, after our army strengthened the construction of shellproof pits, tunnels, and other field defense works, casualties were cut by 41.6 percent. In the famous (Samgong-ri) Campaign, the enemy forces dispatched more than 60,000 men, over 750 cannon, over 170 tanks, and more than 3,000 aircraft sorties to attack in rotation our narrow and long position of only 3.7 square kilometers. Every day about 20,000 rounds of artillery shells were fired, and many times about 300,000 rounds, loosening the mountain rock to a depth of more than a meter. But our volunteers, relying on a position with field tunnels as its backbone, combined fighting and concealment. Fighting bravely for 43 days, they inflicted more than 25,000 casualties on the enemy forces and smashed the enemy's offensive attempt.

When two armies are pitted against each other, the position--this condition--must be stressed. Countless examples of battles prove that whoever seizes advantageous terrain and builds good defense works will wrest the initiative. Therefore, in building field defense works, under the premise of insuring a

certain degree of safety, the most important thing is to strive for high speed. This is an important indication of the engineering support capacity of a country's armed forces.

To increase the speed of building field defense works, the problem of earthwork operations must first be solved. In modern warfare, to build field defense positions for an army division usually requires over 400,000 cubic meters of earthwork. If an antitank network position is to be built, 1 million cubic meters of earthwork must be done, equivalent to the amount required for building a medium-sized reservoir or moving a hill 100 meters long, wide, and high. To complete such a large engineering operation within a short time, one must depend on modernized equipment and bring into full play the role of engineering machinery and demolition and other advanced techniques.

To meet the demands of working under field conditions, countries are vigorously developing field engineering machinery in which one machine has many uses, and the earth-removal rate can reach 200 to 300 cubic meters per hour, equivalent to 500 to 600 man-days. The U.S. has developed an engineering machine family. On one powered vehicle, many kinds of operating units, such as ones for bulldozing, scraping, loading and unloading, and hoisting can be separately mounted, enabling it to replace more than 20 kinds of machines. Many countries use an oil-gas frequency detonating excavator. On this machine is fitted a fuel supply automatic control system. The mixed fuel is constantly combusted in the frequency detonating unit, and by its blasting effect on the workface excavates and throws out earth. The machine's efficiency is 10 to 30 times higher than that of an ordinary engineering machine. The Soviet and American armed forces have fitted onto tanks and gun tractors devices that can carry out earthwork operations in order to raise the capacity of the service arms to support themselves. A Soviet Army tank battalion has three tanks fitted with bulldozing devices. In 6 or 7 hours they can build bunkers for all personnel and tanks in the battalion.

Improved detonating techniques are also an effective way of speeding up earthwork operations. They are usually several to several dozens of times faster than manual operations. The one-man bunker detonator uses a rocket thrust to inject explosives in the earth, and with one blast it forma a 1.1 meter-deep one-man bunker.

The armed forces of many countries are now vigorously popularizing assembled-type defense works in order to increase the speed of building field defense works and improve their protective power. The major characteristics of an assembled-type defense work are: light in weight and convenient to move and use; simple in structure and fast to build; materials in complete sets and strong protection; and mass-produced and cheap to make. Building this type of defense work is like arranging toy building blocks. The various kinds of prefabricated components are connected by fastening pins and screw bars to form defense works with different uses. The weight of a single component is usually several kilograms to several dozen kilograms, and the weight of the components for the entire defense work is no more than several hundred kilograms to a little over a thousand kilograms, making it convenient for carrying on the backs of men or horses, or for transporting by vehicle or

aircraft. The total weight of the components of an aluminum-ribbed shell shelter that is 1.5 meters wide, 1.9 meters high, and 5.6 meters long, and that can accommodate 6 to 10 persons, is only 330 kilograms. One truck can carry 6 to 8 of them. A movable shelter with which the U.S. Army is equipped has a complete set of ventilating and filtering equipment, and five men can put it up in half an hour. The armed forces of many countries are now equipped with complete sets of assembled-type defense work components made of reinforced concrete, corrugated steel, glass fiber-reinforced plastic, and aluminum (steel) alloy materials, which increase the speed of building field defense works and improve their protection. Some armed forces stockpile in a planned manner defense work components in prelaid battlefields and city defense areas in readiness for movement and use in wartime.

Because of innovations in construction methods and structural materials, the speed of building defense positions has been greatly increased. In World War II, 20 to 30 days were required for a group army or division of some countries to build a fairly perfected field defense position; now this takes only 2 to 3 days.

C. Civil Defense Works Integrated for Peacetime and Wartime

In wartime, a country's political and economic centers, and its cities with a high concentration of population and industrial bases, are the key targets of an enemy's surprise attack. The death rate of the inhabitants of these places will increase in accompaniment with the increase in the casualty-producing power of weapons. According to statistics, the number of deaths of these inhabitants in World War I was 5 percent of the total number of deaths in that war; in World War II this figure was 48 percent; and in the Vietnam War it rose sharply to 95 percent. Therefore, civil defense will be an extremely important part of a country's total defense.

Civil defense project construction (including the construction of command posts, shelters, first-aid stations, hospitals, power stations ... and so forth) has an important effect, which cannot be overlooked, on preserving the people's lives and property and the country's war potential. In World War II, because Germany had built a large number of strong civil defense works in its important cities and had taken various anti-air raid measures, in a period of more than 2 years, although the American and British air forces carried out strategic bombing on them, dropping a total of 27 million tons of bombs, the military industry indices not only did not fall but, on the contrary, rose by more than 3 times. According to estimates by some countries, when they suffer an attack by nuclear weapons, cities that have not taken protective measures could have 90 percent of their people injured or killed; in cities that have taken measures for evacuation and protection, the number of casualties could be reduced to 5 to 8 percent. Therefore, after World War II, all developed countries attached extreme importance to the construction of civil defense projects. At present in America and the Soviet Union, civil defense works can hold more than half of the population; in Switzerland and the countries of Northern Europe, civil defense shelters can hold one-third to more than four-fifths of the people. Since 1950, Japan has in planned manner put cities underground. In more than 20 cities, it has built 65 underground streets. It plans by 1985 to increase the length of underground railways in seven cities,

including Tokyo and Osaka, to more than 650 kilometers, and to build underground hydropower plants, transformer stations, and electricity transmission systems. It also stresses the transfer underground of military factories that produce weapons and equipment.

Modern warfare requires that civil defense and city defense be closely integrated to form military-civil joint defense. Civil defense projects must not only provide reliable shelter for the masses of people and the state organs, so that they are able to safely live and work in the defense works and so that important factories can be transferred underground to continue to support war production; but also make it possible for the people to carry out necessary battles of self-defense in the defense works. Therefore, in civil defense projects, there must be the necessary facilities to support life, production, movement, and combat.

Experience proves that only if priority in the construction of civil defense projects is given to insuring wartime needs and to displaying fully peacetime benefits will there be vigorous production, wider and wider approaches, and a strengthening of a country's total protective capacity. According to estimates made by some countries, by persisting in peacetime-wartime integration in civil defense construction, 65 to 85 percent of the investment can be saved, and also underground space can be fully utilized, thereby alleviating the "pressure" on the surface of cities. Therefore, civil defense works construction should integrate underground defense works with aboveground structures, underground traffic networks with centers of activity, making a vertical integration of the underground and the aboveground. Of the 116-storey international trade center building that America is now building, 6 storeys will be underground, and subways will extend in all directions and there will also be underground parking lots. At the same time it plans to rebuild underground pipelines into evacuation trunk roads, so that an entire city is connected into one organic whole. In peacetime, the sequence in which a city's inhabitants enter the pipelines is stipulated. If the city suffers an air raid, within 15 minutes all its inhabitants can go underground and be swiftly evacuated to the suburbs.

Under the guidance of the policy of our country's people of "dig tunnels deep, store grains everywhere, and never seek hegemony," all cities and towns in the country have built underground projects of different scales, which provide fairly good protection against all kinds of weapons. In the past by using tunnel warfare, we could hit the enemy so hard that he was thrown into confusion. Today, relying on strong protective projects, we can utterly rout an invading enemy. If the hegemonists have the audacity to violate our country's sacred territory, they will certainly follow the same old disastrous road of the aggressor and suffer a shameful defeat.

II. Obstacles That Integrate Blocking and Blowing Up

In ground operations under modern conditions, the tank has become the main force for surprise attacks. At present, the tank divisions and motorized infantry divisions of the superpowers are completely armored. In the main campaign direction, they will frequently use groups of tanks and armored cars to make successive attacks in many waves and in great depth. The number of

tanks on each kilometer of frontage will be more than 50. Therefore, in placing obstacles on the battlefield, we must give priority to antitank obstacles, integrating them with anti-infantry obstacles. At the same time, on the basis of using natural obstacles and built-up obstacles, we must widely lay mines, forming an obstacle system that can both block and blow up and that integrates the long, medium, and close distances. In this way, from far to near there will be layers of obstructions, making the enemy pay an enormous price for every step that he advances.

A. Mines Laid Everywhere

Ever since mines appeared on the battlefield, for infantry it has been as if they were walking on a rug of needles, for cavalry it has been as if they were tied by shackles, and armored forces are also always in danger of being blown up. According to statistics, in World War II, on the battlefield 2 to 3 percent of personnel casualties were caused by mines, and 20 percent of the number of tanks that were damaged were damaged by mines. On the Korean battlefields, mines accounted for 30 percent of the number of casualties among the American troops that were mounting aggression against Korea, and 70 percent of their damaged tanks were damaged by mines. Because the mine's effect in war is enormous, it has become a weapon for key development by the armed forces of all countries.

There are many kinds of mines, and the kinds most widely used are the antitank mine and the anti-infantry mine. At present, the direction of development of the antitank mine is mainly to constantly improve its powder charge structure by using high-energy explosives to raise its armor-destroying capacity; to improve its detonating structure by using nonmetallic materials in making the mine case to raise its explosion-resistance and sweeping-resistance capacity; and to reduce the weight and bulk of the mine's body to raise its capacity for fast, mobile laying. After World War II, mines were developed in succession that were detonated by non-contact means such as by electromagnetism, shock, and infrared rays. At the end of the 1970's, there appeared the "self-seeking mine" that was able to attack tanks on its own initiative. Once a tank enters its warning area, this mine flies up in the air and pounces on its target. It is better than an antitank guided missile that has no operator, and its efficiency in damaging a tank is several dozens to several hundreds of times higher than that of an ordinary mine. The kinds, functions, and uses of antitank mines were discussed in detail in Chapter II, so there is no need to go into them here.

Even though a modernized army is completely armored, infantry must always step on the ground, so the anti-infantry mine is still extremely necessary. After World War II, the anti-infantry mine developed in the direction of diversity, miniaturization, high explosive effect, difficult removal, and timed self-destruction. It was widely used in coordination with the antitank mine to hold back the enemy's movement and to inflict casualties on his effective strength.

The anti-infantry mines of the past were usually fairly heavy, the smallest weighing a jin, a fact which caused difficulties in transporting them and in laying them over a large area. Some modern anti-infantry mines have been

lightened to be several liang [one liang equals 50 grams] in weight. A sack mine used by the American Army on Vietnam battlefields weighs 1 to 1.5 liang; it is shaped like a tree leaf and so is also called a tree leaf mine. When aircraft are used to lay these mines, each mine layer can hold 4,000 of them. Another subminiature mine is only the size of a copper coin. Another kind is a bat-shaped mine. In it are 6 milliliters of liquid explosives, and it weighs only a little over two liang. On the battlefield, this miniature mine can wound by blast the lower limbs of the human body, causing a depletion in the number of soldiers in a battle.

To improve the range and results in inflicting casualties of a single mine, in many new-type anti-infantry mines the techniques of prefabricated or semiprefabricated fragmentation and controlled direction fragmentation dispersal are used. For example, there is a trip mine in which, after being dropped from the air onto the ground, eight nylon trip-lines, each 8 to 10 meters long, automatically spring out of it. Inside the mine, which is shaped like a spider, is an extremely sensitive electronic detonator. and at the slightest touch on a trip line the mine will explode. After this mine is exploded, thousands of fragments, each the size of a grain of rice, fly out and can cause casualties within a diameter of 16 meters. Its blocking width is many times greater than that of a pressure mine.

There is another kind of directional mine in which photoelectricity detonates an explosion. It is able to control the direction in which the fragments fly, thereby increasing the target hit rate. After this mine is aimed at a preset direction and detonated, thousands of prefabricated fragments or steel balls, which had been stuck to its arc-shaped surface, shoot out simultaneously toward the front. Some of them, at a distance of 150 meters, form a 100-meter-wide, 4-meter-high barrage that can inflict a large number of casualties on personnel who are crowded together and on grouped targets.

In addition, there is a completely new type of cord mine. When laid in a minefield, it can even more effectively block the enemy by inflicting casualties on his effective strength. After being detonated every cord mine's effective casualty-producing distance is about 30 meters, and if several of them are connected a protective blocking minefield that is hard to discover will be laid.

Mines that explode on the ground can only inflict casualties on an enemy on a plane surface, but a bouncing mine has a three-dimensional effect in producing casualties. After this mine is detonated, the mine charge rises 0.5 to 2 meters in the air and explodes, producing a large number of fragments. It can not only inflict casualties on targets which touch it, but also on targets within a range of several dozen meters. In a propelling mine, which is specially used against airborne forces and low-altitude aircraft, a propelling tube fires some mines several dozen to several hundred meters into the air, where they explode, suddenly forming a concentrated casualty-producing space that is difficult for the enemy to fly through.

For many years people fantasized about laying minebelts, like putting down carpets, either in front of a position or along the enemy's line of approach, thereby making it hard for the enemy to move an inch. With the appearance of

liquid explosives, this fantasy became reality. By using vehicles, aircraft, or men to pour liquid explosives directly on the ground and then scattering detonators, when infantry, cavalry, and light vehicles tread on this "mine carpet" they will be blown up.

Some countries have developed toxic mines and atomic mines. We certainly cannot take lightly the risk of them being used in a war started by the hegemonists to inflict utterly inhuman large-scale casualties.

Because the role of mines in modern warfare is so prominent, the number of them that will be used has increased to an unprecedented degree. Frequently a single campaign will require several million mines. If such an enormous number of mines are to be laid on the flaming battlefield of war, it will not do to rely solely on manual operations. Especially since situations in modern warfare are complex and fast-changing, they do not permit mines to be laid in advance. Thus, various countries are vigorously developing high-speed, mobile mine laying by machines, aircraft, rockets, and cannon.

The earliest machine mine laying was when a mine-spreading chute was attached to the back of a vehicle, and as the vehicle was driven the mines were placed on the ground in a pattern. Later there appeared a special armored minelayer, which towed a plow colter and buried the mines in the ground. In recent years there has appeared a throwing minelayer. This vehicle is equipped with six square launching cases, and each case hold 100 antitank mines. As it advances it throws mines out to a distance of 20 to 40 meters on each side. In one operation it can lay a minefield 40 to 80 meters in width and 3 km in length.

The earliest aircraft minelaying occurred on the Korean battlefields. At that time the American forces used helicopters to lay a large number of anti-infantry mines. Now bombers and fighters are used for high-speed laying of anti-infantry and antitank mines. One aircraft from which is suspended a minelayer can in one flight lay 7,680 bat mines, within several seconds laying a minefield with a frontage of several kilometers. Aircraft mine laying is mainly used to quickly seal an enemy's atomic breach, cover a unit's exposed flank, and strengthen or restore an obstacle system. They can lay mines directly on enemy tank concentrations and enemy airborne landing zones in order to break up the enemy's battle formations and cut his line of retreat. They can also take the enemy by surprise by laying a large number of mines around important targets such as the enemy's command posts, airfields, communication hubs, crossing points, ports, and guided missiles to restrict his movements and disrupt his operational deployments. This has caused the mine to develop from a purely defensive obstacle to an offensive weapon.

Rocket minelaying appeared in the 1970's, and its operational uses are roughly the same as those of aircraft minelaying. Using the motive power of a rocket a mine-laying projectile packed with a large number of mines is propelled several hundred meters to several dozen kilometers, laying a minefield or mine cluster. Thus it possesses greater surprise, flexibility, and offense. In World War II, about 5 hours were needed by an engineer company to lay an antitank minefield on 1 kilometer of frontage, but with the use of rocket minelaying this job would take only a few dozen seconds. If electric-contact detonators are fitted onto mines laid by rockets, the mines, which fill the

sky when scattered, will land on an armored car like a small bomb; if they land on the ground they will become explosive obstacles that threaten the enemy's movements. At the same time as rocket minelaying is being developed, cannon minelaying is also being vigorously popularized, even more enlarging the mine's scope.

To meet the need for large-scale mobile mine laying on the battlefield, some countries have set up a series of rapid mine laying over a large area at far, medium, and close ranges: aircraft and medium-range rockets lay mines at the far range of 60 to 70 kilometers; helicopters and light rocket-guns lay mines at the medium range of 14 to 15 kilometers; and mechanized minelayers and rocket-guns lay mines at the close range of 800 to 3,000 meters. Thus, a large in-depth obstacle area is formed, and in conjunction with layers of firepower interceptions, the enemy is delayed at every step.

B. Cleverly Constructed Obstacles

Among the constructed anti-infantry obstacles there are antitank ditches, pits, post obstacles, pyramids, rock barriers, caltrops, broken precipices, and rock walls. These obstacles are mainly placed and built based on the tank's technical performance in climbing ability, width of ditch it can cross, and vertical climbing height. For example, on fairly level terrain, the antitank ditches that are built usually are 4.5 to 5 meters wide and 2 to 2.5 meters deep. When a tank falls into this ditch, it finds it hard to climb out. On terrain with a slope of 15 to 45 degrees precipices and broken precipices are built, and on level terrain post obstacles, fraises, caltrops, pyramids, and rock barriers are built, all of which cause a tank that is dashing around madly to tumble over. These obstacles can effectively hold back the movement of the enemy and break up the formations of his massed tanks, providing our antitank weapons with a good opportunity for aimed fire.

In building and setting up constructed obstacles, it is easy to get materials, the work is simple, their blocking strength is great, and their power to survive is strong. Once a mine is exploded, it loses its blocking power, but a constructed obstacle can play its role for a long time. If constructed obstacles and explosive obstacles are used in combination, there is both blocking and exploding, and the power is greater.

C. Sabotage Operations

Another important engineering method to restrict and destroy the enemy's mobility is to use, flexibly and with mobility, demolition techniques to conduct sabotage operations. Based on the development of a campaign or battle, at the right moment lines of communication that the enemy must traverse, defiles, bridges, crossing points, posts, and airfields and other important installations are destroyed, creating for the enemy's mobility and operational actions obstacles that are hard to overcome. This became particularly true after the new technology of directional blasting was applied on the battlefield to topple over, in the twinkling of an eye, several thousands to several tens of thousands of earth and stone at mountain pass entrances or communication hubs and aircraft runways to block an advancing enemy or cut his line of retreat. Thus the enemy's aircraft could not take off

or land and his warships could not leave port, putting him in a plight of being passive and vulnerable to attack.

To increase the surprise element in sabotage operations so that the enemy finds it hard to guard against them, usually a powder room is secretly dug at a preselected target. Just before a battle it is packed with explosive charges and an igniting line is laid. At the right moment the charge is detonated by a remote control device, suddenly forming an insurmountable barrier.

Sabotage is also widely used in harassing attacks in the enemy's rear to destroy the enemy's communication centers and his oil and water pipelines and other supply facilities. During World War II, in North Africa the British Army once imposed a tight blockade on the German Army's POL supply lines, preventing most of the tanks in an armored forces regiment from moving, and more than 400 of them became the British Army's spoils of war. From 1943 to 1944, the Soviet Army specially organized demolition teams, which went deep into areas occupied by the German Army. They blew up more than 300 bridges, more than 500 military trains, more than 600 transport vehicles, more than 300 tanks, and more than 300 self-propelled guns, dealing the enemy a heavy blow. Our country has a glorious tradition of initiating demolition warfare in the enemy's rear. In a future war against aggression, the widespread initiation of sabotage operations in the enemy's rear is also bound to be of meritorious service in coordinating with battlefield operations on the front.

III. Measures That Insure Mobility

An important part of engineering support is to remove obstacles, open routes, build roads, lay bridges, and set up crossing points for the operations of combined arms forces in order to insure that they have freedom of movement.

A. Removing Obstacles and Opening Routes

Battlefield obstacles are extremely complex. During an offensive operation, routes through the enemy's obstacles must first be opened. An attack by a motorized infantry division usually requires that, among the enemy's obstacles, 10 to 20 routes be opened for tanks and infantry. In a defensive operation, to insure that units in the war zone have the freedom to move and take combat action, routes also need to be swiftly opened among all sorts of obstacles. Particularly in modern warfare, there must be timely removal of mine obstacles that the enemy can scatter at any time by aircraft, rockets, and cannon in our in-depth defense.

Constructed obstacles present a clear target, and cannon fire, bombing, and successive demolitions can be used to remove them. However, because the mine's capacity to resist sweeping is being improved day by day, and because the methods of laying mines are fast and flexible, opening routes in a minefield has become a difficult problem for engineering support.

On the battlefield, to remove mines laid secretively by the enemy one must first find the position of the minefield and the mines with mine-detecting equipment. Among new-type mine-detecting equipment are: the electromagnetic

induction mine detector, the metal radiation mine detector, and the microwave mine detector developed for use against nonmetallic mines. The microwave mine detector can search for various kinds of mines with metallic or nonmetallic cases that are buried 30 centimeters in the ground. One soldier can carry and operate this mine detector, and it can also be fitted onto a road mine-detecting vehicle.

There is also a thermal-imaging mine detector, which uses an infrared radiation imaging device to discover mines. Aircraft fitted with an infrared photographic mine detector or a harmonic radar mine detector, when accompanying units on the move, are able to timely discover minefields and thus the units will avoid an enemy surprise attack by large-scale, fast mine laying.

Many countries have developed a mine detector that is able to detect the smell (trace element) of the explosives in a mine. Once the detector picks up a faint smell of explosives, it automatically sends a signal indicating the mine's position. Some countries are developing new equipment for mine detection that uses high-energy physics and biological techniques.

The purpose of detecting a mine laid by the enemy is to remove it. At present mine-removal techniques are developing in the direction of mechanization. For example, the front of the mine-sweeping tank is fitted with a mine-sweeping roller, mine-sweeping hammer, or mine-sweeping plow, and the tank can compression-blast, penetration-explode, or shovel the mines to one side. It is fairly effective in opening a route in a minefield. In the demolition method of opening a route, explosives are put in a tube or parcel to form a direct-column powder charge (if the length of the powder charge is three times its diameter it is called a direct-column powder charge), which is then put in the minefield and exploded, blowing up the mines by penetration. To achieve surprise and insure the safety of the working personnel, rockets are widely used for motive power. They send the powder charge into the obstacle area, where it is detonated to open a route. In the "Boa Constrictor" rocket minesweeper developed by the British Army, a complete set of equipment is fitted onto a trailer, which is towed by a tank or armored car. After the rocket is fired, 1,500 kilometers of plastic explosives are detonated among the obstacles, which open a route for tanks that is 100 meters long and 7.4 meters wide.

Air-burning explosives, which appeared in the 1960's, were first used by the U.S. Army on the Vietnam battlefields to sweep mines. Because after this kind of explosive is detonated, it produces a shockwave of 20 to 30 atmospheres, and also because its effect lasts a long time, it can explode by penetration mines fitted with pressure or contact detonators, or composite detonators. A 30-tube rocket-launching can, in the twinkling of an eye, launch 30 air-fueled explosive rockets to a minefield 300 to 1,000 meters away, opening a route that is 8 meters wide and 100 to 200 meters in depth. If liquid explosives are sprayed on the surface of a minefield to set off the detonators of the mines, a large area can also be swept of mines. Air-burning explosives also possess a high capacity to sweep mines under water.

B. Building Roads To Intertwine and Form a Network

Following the increasing rise in the degree of mechanization and motorization of units, and the constant increase in their dependence on rear supply, almost no campaign or battle can be separated from road support. To seize the initiative, the two sides in a war are bound to launch an intense struggle on the lines of communication of sabotage and antisabotage, blockade and antiblockade. In their war of aggression against Korea, the American forces used 70 percent of their air forces and close to 100,000 tons of bombs to block lines of communication. In the Vietnam War, 80 percent of the bombs dropped by them were concentrated on the "Ho Chi Minh Trail." In modern warfare, even higher demands are imposed on the quantity and quality of roads as well as on such facilities as bridges and ferries. In the past an infantry division could advance on one or two roads. Now if a motorized infantry-division advances along only one road, it drags a "tail" about 180 kilometers long. With such a "long dragon" moving on the battlefield, how can its movement be flexible, concealed, and fast? Therefore, to support the advance of a motorized infantry division, there must be four to six longitudinal highways in the main campaign direction that are not under the state's third-grade standard. To enable the units to support each other and conduct mobile operations, there also needs to be a certain number of latitudinal roads. In this way, the longitudinal roads and the latitudinal roads intertwine to form a network, connecting the front and the rear, the left and the right, and spreading everywhere, thereby insuring that the units have freedom of movement.

With the development of modern engineering machinery, the engineering operations in support of battlefield roads are all mechanized, from digging and filling, ramming, and pressing level to laying the road surface. A rapid road-laying machine, which combines the functions of pushing, scraping, leveling, and grading, can go through wasteland and hills, leaving behind a hastily constructed military road.

C. Laying Pontoon Bridges To Cross Rivers

During the construction of a road network, bridges and ferries must be considered the key links of utmost importance to all fronts, and often if one bridge is destroyed all fronts are blocked. In the history of wars fought by foreign armies, there is no lack of examples when a river crossing affected the course of the war. In the autumn of 1943, in the Soviet Army's campaign to fight its way across the Dnieper River, because, from group army to the division, it was not equipped with pontoon bridge-making equipment, and also because there was a lack of thorough preparations to cross the river, it took the Soviet Army 14 days to fight its way across the river, seriously affecting the development of the campaign.

To meet the needs of modern warfare by insuring that units, under all sorts of conditions, cross rivers quickly, many countries, while widely improving the capabilities of tanks and various kinds of vehicles to ford rivers and cross them submerged, are vigorously developing complete sets of equipment for river reconnaissance and for making pontoon bridges and military bridges. At present, as compared with the speed of laying pontoon bridges in World War II,

the U.S. Army has raised this speed 18 times and the Soviet Army 10 times. In 1967, on the Dnieper River, the Soviet Army conducted a forced river crossing on the largest scale since World War II. In only a little over 1 hour, it threw a 700-meter-long pontoon bridge that tanks could traverse across the river. During the Fourth Middle East War, the Egyptian Army used new-type crossing equipment. In only 9 hours, it built 10 pontoon bridge crossing sites and 50 boat raft crossing sites on the Suez Canal. It also laid two underwater bridges (in laying bridges under water, usually the bridge surface is less than 30 to 50 centimeters under water). Thus it supported the crossing of the canal by infantry and tanks, which on all fronts attacked and occupied the "Bar Lev Line," which the Israeli Army had boasted as a line that could not be breached. In the Egyptian Army's seizing of the initiative in the early stage of the war, this support played a decisive role.

Pontoon bridge equipment consists of manufactured river-crossing equipment for building pontoon bridges or boat rafts. Usually the equipment consists of bridge-pier pontoons, bridge trusses, bridge floors, transport vehicles, and auxiliary equipment. Since the 1970's, various countries have striven to make and equip their units with belt pontoon bridges, breaking the several centuries' tradition of pontoon bridges being of a structural form in which the bridge-pier pontoons, the bridge stresses, and the bridge floor were separated by combining them into one sealed box-shaped pontoon body. The spaces inside the pontoon are filled with a lightweight porous material, and thus it has a strong resistance to disturbance. Even if hit by a shell, the pontoon body will not sink. At the same time, the pontoon body can be folded or loaded on a truck for transport, or on a helicopter for hoist-transport. When put on the surface of water it automatically unfolds to become a boat raft. The boat rafts are joined by coupling to become a pontoon bridge with a shape like a belt fastened across the river. The degree of mechanization in laying belt pontoon bridges is quite high. Compared with old-style pontoon bridge equipment, the speed in laying the bridge is 4 to 5 times faster, 1/3 to 4/5 of the manpower is saved, and the number of transport vehicles is cut by more than a half. Four folding-type pontoon bridge pieces of equipment, of the kind that the Soviet Army is equipped with, are operated by 136 men. It takes them only half an hour to lay a pontoon bridge that is 227 meters long with a load capacity of 50 tons, over which 600 to 800 tanks can cross each hour. This kind of pontoon bridge equipment can also construct boat rafts able to ferry 40 to 150 tons of materials.

A self-propelled pontoon bridge that joins bridge and vehicle into one is a big improvement over the belt pontoon bridge. It carries the bridge on its top part, and is able to propel itself on water and land and to float on water. Boat rafts and pontoon bridges that are quickly and automatically laid have a load capacity of 50 to 100 tons. Under emergency circumstances, they are speedily set aside and moved to crossing points. They are particularly suited for strong rivers. To improve their load capacity, air-filled rubber float bags or aluminum alloy floats can be added to the two sides of the bridge vehicle.

Railway pontoon bridges have a large load capacity and good stability. They are mostly used at fixed points to support railway transportation. There is a rail and road heavy pontoon bridge, in which trains use the main lane and

tanks and trucks use the secondary lane, so as to insure uninterrupted transport.

D. Flying Buttress Military Bridge That Accompanies Units

On a battlefield crisscrossed with ravines and densely covered with a network of rivers, particularly on rivers where the current exceeds 3 meters, there are fairly many drifting objects, and there are fairly steep banks, and also for dry ditches, gorges, and antitank ditches, it is not convenient to lay pontoon bridges, but fixed bridge pier military bridges can be laid. Like pontoon bridge equipment, military bridge equipment is developing in the direction of high mobility, high load capacity, and high laying speed, and the possession of a certain armor protection capacity.

To suit bridge-laying speed to the speed of the units' advance or assault, a bridge-laying tank, which has a complete set of bridge components fitted onto a tank chassis, is used. Within 3 to 5 minutes, it can lay a bridge 30 meters long. Accompanying groups of tanks that are making an assault, it insures the timely crossing of antitank ditches and narrow gullies and ravines. Therefore, the bridge-laying tank is also called an attack bridge.

A high-speed water and land dual-purpose bridge can also accompany a tank assault. On land its driving speed reaches 70 kilometers per hour. When it comes to the bank of a dry ditch, a bridge vehicle automatically unfolds to become a bridge 30 meters long with a load capacity of 60 tons. When unfolded over water it is a self-propelled bridge raft, and when four bridge rafts are connected they become a 100-meter-long pontoon bridge. The high-speed water and land bridge was developed on the basis of the self-propelled pontoon bridge, but its working efficiency is three times higher than the latter and requires one-third fewer personnel to operate.

After supporting the completion of the assault mission of tanks and armored battle cars, the bridge-laying tank and high-speed water and land bridge must be timely moved toward the front to keep up with the advance of the assaulting units, so as to insure that the units make a continuous assault. Therefore, comparatively durable bridges are needed to replace them in order to insure the unimpeded passage of the follow-up units. Mechanized bridges and assembly-type bridges are mainly used to replace these bridge-laying pieces of equipment.

A mechanized bridge is a bridge vehicle made by equipping a special vehicle with a complete set of bridge section members such as bridge pier, bridge truss, and bridge floor. After the bridge vehicle is driven to the bridge-laying point, it uses its own motive power to lay the bridge. The height of the bridge pier is raised or lowered based upon the depth of the river and the height of its banks, and several bridge sections are connected to form a bridge. There is also a heavy mechanized bridge that is composed of two tracked bridge vehicles and three wheeled bridge vehicles. They can lay a 100-meter-long bridge for tanks to cross.

An assembly-type bridge is assembled with standardized bridge components. Either by mechanical power or manpower, it is assembled while being pushed

toward the opposite bank. After being laid it becomes a semipermanent bridge, and is mostly used to replace a bridge that accompanies units. Its main characteristic is that there is no middle bridge pier, making it particularly suitable for laying over deep ditches, gorges, and high-banked, fast-current rivers. In the past several years, many countries have vied to get the medium truss bridge developed by Britain. This assembly-type bridge is made of an aluminum-zinc-magnesium alloy. It is strong, light, simple in structure, and fast to lay. In 40 minutes 25 men can lay a bridge with a load capacity of 60 tons and a length of 31 meters.

At present, America, Britain, and West Germany are pooling efforts to develop a "1980's bridge equipment class" that is standardized, interchangeable, and seriated. This equipment class, which includes attack bridges, pontoon bridges, and fixed bridges, forms a relay-type river-crossing support system that can in succession support a first-echelon assault, a second-echelon advance, and rear transportation.

IV. Camouflage That Conceals the True and Displays the False

Camouflage is a measure taken to conceal the true and display the false in order to conceal oneself and deceive and confuse the enemy. Careful campaign and tactical camouflage can seal up the enemy's eyes and ears, and make his commanders so alarmed and nervous that they are blind, deaf, and crazy, thereby providing the conditions for preserving oneself, wiping out the enemy, and winning victory. Therefore, all strategists, ancient and modern, Chinese and foreign, have come up with clever schemes for camouflage.

As early as more than 1,800 years ago, Zhuge Liang made clever use of camouflage by "making use of arrows fired at straw boats." Without losing a single boat or a single soldier, he got 100,000 arrows. Zhuge Liang's use of haze and fog, his erecting "green cloth screens" on boats, his sticking up straw men, and his "beating drums and loudly shouting" are highly similar to today's "natural camouflage," "artificial covers" "false targets," and "sound camouflage." With the widespread application of reconnaissance techniques on the battlefield, camouflage not only must counter visible reconnaissance that can be seen by the human eye but also infrared ray, radar, and laser reconnaissance that cannot be seen by the human eye. It not only must counter surface reconnaissance but also aerial and even outer space three-dimensional reconnaissance. Only by using all sorts of camouflage measures by suiting them to local conditions and cleverly effecting tactical, campaign, and even strategic camouflage will one be able to insure the success of operational actions.

A. Natural Camouflage That Has Exceptional Advantages

Units that pass through the depths of a thick forest and reconnaissance soldiers who crawl in high grass are hard for the enemy to discover. Camouflage that makes use of terrain (surface features and landforms), the darkness of night, weather with poor visibility, and other natural conditions is generally called natural camouflage.

The main methods of natural camouflage are: First, giving reconnaissance a blind angle and concealing targets by making use of valley land, earth folds, rain ditches, earth embankments, and structures. Second, forming a natural concealment of targets by making use of trees, reeds, wild grass, and high-stalk crops. Third, deploying targets against background spots (figures) that approach the color and shape of the targets in order to reduce its noticeability. Fourth, making military movements in the darkness of night or in thick fog, heavy rain, or blowing snow, when visibility is poor.

B. Artificial Covers With Many Functions

The camouflage clothing that fighters wear, the camouflage headgear that they put on, and the camouflage nets put over transport vehicles are the simplest artificial covers. So-called artificial covers are camouflage methods that use various materials and measures to screen a target so as to impede the enemy's reconnaissance on the surface and in the air. For a long time materials such as bushes and trees, cotton and hemp have been used to make the covers. To make the covers light in weight, fast to set up, and long in life, and also to have many functions, in most new-type artificial covers materials, such as polyvinyl chloride film, plastic yarn, and nylon cord are used.

A multifunctional camouflage net simultaneously possesses the functions of countering visible light, infrared, and radar reconnaissance. On different terrain, such as forests, deserts, snowy ground, and water surface, it can be used to camouflage various targets, such as tanks, aircraft, ships, and buildings.

A terrain-reflecting cover, which is made of aluminum-plated polyester film, is put in an appropriate position on the target's front. Like a "reflector," it reflects the natural scene in the terrain surrounding the target on it, fusing the target and its background. In daytime the target cannot be distinguished at a distance outside 50 meters; at nighttime, at a distance outside 35 meters, even with a night-vision device it is hard to discover.

Following the widespread application of radar reconnaissance, the role of antiradar jamming covers has become more prominent. This cover is fitted with cube corner reflectors and jamming filaments that reflect or scatter radar waves. They cause a large number of fairly bright cursor signals to appear on the enemy radar's fluorescent screen, which cover up the target's signals, or they make the target's echoes very weak, and thus the radar is unable to identify the target. In 1968, when the Soviet Army invaded Czechoslovakia, it once scattered a large number of "atmospheric suspensoids" that jam radar, causing the radar fluorescent screens of the armed forces of the NATO countries to go blank and be unable to distinguish anything. Radar reconnaissance can also be dealt with by setting up in a planned manner cube corner reflectors at the side of roads over which technical weapons move or within their deployment zones.

C. Color Camouflage Like the Color-Changing Dragon

In the natural world there is a small crawling animal called the color-changing dragon, which is also called the chameleon. It can change the color

of its body in adaptation to the changes in its environment. This color-changing skill has an estimable camouflage effect. Based on this phenomenon, people have skillfully painted colors on the target or its cover, or on the target's background, to reduce the target's noticeability. This camouflage method is called color camouflage. Painting tanks grass green, aircraft silver gray, and warships orchid gray are all instances of single-color camouflage. If the surface of a tank or vehicle is painted with color spots in an unpatterned way, like a snakeskin, an observer cannot clearly see the target's shape, and thus the degree of noticeability of a moving target in a terrain of complex colors is reduced. This is called deforming color camouflage.

Copy color camouflage is mostly used for fixed targets. On the target is painted scenery like that of its background, making the target become a continuous part of the background spots in order to deceive the enemy. If a color-changing paint is painted on a target, the color of the target will automatically change to conform to the many changes in the hue of the background, and will also change in conformity with the changes in time and brightness. On cloudy days it turns dark green and at night it turns black, becoming worthy of the name "color-changing dragon." Color camouflage not only can prevent visible-light reconnaissance but also infrared and radar reconnaissance. According to relevant data, a target that is scientifically color-camouflaged can reduce the ability of the enemy's reconnaissance to discover the target to 30 percent.

D. Smokescreens That Cover the Sky and Hide the Sun

When facing an attacker, the cuttlefish will suddenly release a stream of ink that dyes the sea water black, thereby confusing the attacker and giving it an opportunity to escape. The special skills of living things have stimulated man's intelligence. Following the development of bionics, there also appeared on the battlefield a camouflage method in which a smokescreen is laid to cover the target and confuse the other side.

Smokescreen camouflage is a means of camouflage that is both ancient and of practical significance. In a smokescreen of moderate thickness, visibility is no more than 10 to 15 meters; in a thick smokescreen, visibility is no more than 5 meters. The results of firing at a target completely covered by a smokescreen are only a fourth of what they are when firing at a target under normal circumstances. A special type of smokescreen can prevent reconnaissance by night-vision instruments and radar, and can effectively interfere with various kinds of guided weapons launched in the air or on the surface. In the beginning stage of the Fourth Middle East War, Egypt used antitank guided missiles, which in only 2 hours destroyed more than 130 tanks of the Israeli Army in the Sinai Desert. Later, the Isreli Army laid a large number of smokescreens, and its losses were immediately reduced by two-thirds to three-fourths. Since this incident, the attention of various countries has been aroused, and thus they are vigorously developing a camouflage system suited to the rapid laying of smokescreens over a large area.

Most of the multifunctional smokescreens which can prevent visible light, radar, and infrared reconnaissance are composed of metal compounds and ions. Some of them release a stream of foam high polymer material into the air,

where it condenses and atomizes to form a smokescreen. Others are materials in which an exchange of ions occurs when combusted, thereby partially ionizing the air and forming an ion cloud that covers the target. Thus, reconnaissance instruments such as radar, television, laser, and infrared instruments are unable to discover the target, and the normal working of certain electronic equipment is disrupted. There is also a smokescreen colored like the target's background that is able even more effectively to coordinate with other means of camouflage to conceal the target.

There are many kinds of smoke-emitting equipment that various countries are vying with each other to develop. The principal ones are the smoke grenade, smoke pot, smoke cannon, smoke bomb, and smoke rocket. To rapidly lay a smokescreen cover, technical weapons such as trucks, tanks, cannon, rockets, aircraft, and ships are widely used. The smokescreen layer on an aircraft, by spraying a liquid smokescreen agent, can at one go lay a 2,500-meter vertical smokescreen which lasts for 15 minutes. A small smoke rocket can within 5 seconds be fired into the air and form a smokescreen cloud of several hundred meters in the flight path of enemy aircraft coming to raid. The cloud conceals a surface target, making it hard for the enemy aircraft to get close enough to the target to make its attack. A smokescreen layer fitted onto a tank can at one go lay a smokescreen 250 to 400 meters long. When the tank's driver discovers that his tank is being aimed at by antitank weapons or tracked missiles, he presses a button that fires 12 smoke bombs simultaneously toward the front, forming an arc-shaped smokescreen cover, thereby enabling him to make a swift escape.

E. Lifelike Dummy Targets

Military strategists are clever at creating confusion by passing off the spurious as genuine. There is plenty of scope on the modern battlefield for dummy targets of all descriptions. During the Fourth Middle East War, strategic reconnaissance aircraft and two reconnaissance satellites that the U.S. forces sent and launched failed to penetrate the disguise of the dummy guided missile positions set up by the Egyptian Army. Only when the Israeli Army made a sneak raid on these positions and came up empty-handed was it realized that these positions were dummies. Therefore, the armed forces of various countries have attached extreme importance to the setting up of dummy targets, including the building of dummy defense positions, defense works, ferries, bridges, airfields, and so forth. Usually, at the same time that true targets are deployed, a large number of dummy targets are set up, so that the concealment of the true and the display of the false complement each other. The secret that the Soviet forces had set up more than 130 dummy airfields was revealed when Soviet Air Force Lieutenant Belyenko defected with a MiG-25 jet.

To meet the need on the battlefield for the large-scale, rapid setting up of dummy targets, light, elastic materials such as plastic are mostly used in peacetime in the batch manufacture of air-filled dummy tanks, cannon, vehicles, and other dummy targets. Just like plastic air-filled toys, these dummy targets are small in bulk, light in weight, convenient to transport, simple to set up, and easy to make. When setting them up they can be inflated in only a few minutes, during which time their bulk swells from several times

to a dozen times, becoming dummy targets of the same size as the real thing and lifelike in appearance. To deceive the enemy's radar and infrared reconnaissance, heat sources can be put in the dummy targets or cube corner reflectors can be set up on them, so that on the enemy's reconnaissance instruments there will appear signals or images like those of the true targets.

During battle, to draw the attention of the enemy to dummy firing positions, the signs of weapons being fired, such as flashes, sounds, smoke, and dust, can be simulated. At the necessary time, there will be moving fire by some real weapons, or the dummy firing signs will be combined with the laying of smokescreens, to heighten the sense of reality in order to deceive the enemy.

Since the development of modern reconnaissance technology changes with each passing day, it is often hard for a single camouflage method to be effective. Therefore, modern camouflage science stresses the use of all camouflage equipment and means to effect comprehensive camouflage. Thus, one is able to obliterate effectively all signs that would reveal a target, and attain the goal of concealing the true and displaying the false. In Chapter 10, the world-famous "Normandy Landing" was touched upon. It was an example in World War II of the success in effecting campaign camouflage by using comprehensive means. For this landing operation, Britain and America adopted a series of measures to maintain strict secrecy and to conceal cleverly the true and display the false. In one night they put a million-strong army ashore, which swiftly charged into the enemy's defenses to a depth of 10 to 35 kilometers. Afterward, British Prime Minister Churchill said with emotion: "I did not expect camouflage to have such a great effect."

There are various items in engineering support, and they touch upon every domain on the battlefield, directly relating to the campaign and battle actions of all branches and arms of the service. Therefore, we must keep in mind the overall strategic situation by making comprehensive preparations in peacetime and carefully organizing in wartime, and also vigorously promote its modernization, so as to insure victory in a war against aggression.

Chapter 13: Striving for National Defense Modernization

At present, the entire party, the entire army, and the people of all nationalities throughout the country are responding to the party Central Committee's great call to struggle hard to usher in a new situation in our country's construction of socialist modernization, gradually building a socialist country that has modern agriculture, modern industry, modern national defense, and modern science and technology, and that has a high degree of democracy and a high degree of civilization. National defense modernization is an important part of the construction of the four modernizations, and we have ample conditions for and staunch faith in attaining this great goal.

First, we have the party's staunch leadership, and this is the basic guarantee for effecting national defense modernization. The great CPC is a politically mature party that has long been tested and has extremely rich experience in struggle. She has the ability to lead all people in the country to win victory in revolution and construction. Since the founding of the PRC, under the party's leadership, we have vanquished the threats, subversion, sabotage, and armed challenges of imperialism and hegemonism, and have safeguarded the independence and security of the great motherland. We have also successfully achieved the great transition from New Democracy to socialism, and have won major victories in socialist revolution and the building of socialism. Particularly since the Third Plenary Session of the Eleventh CPC Central Committee, when the focus of the party's work was shifted to the construction of socialist modernization, the party has formulated correct political, ideological, and organizational lines, as well as a series of principles and policies, which have put all the work of the country on the correct track. The work is developing forward in a solid manner, and enormous political and economic successes have been obtained. After summing up experiences in both positive and negative aspects in our country's building of socialism, the party Central Committee put forward a policy for construction that conforms to economic laws and natural laws, and that puts economic construction on a new path in which the speed of it is comparatively dependable, the economic results are comparatively good, and the people can get more material benefits. Like industry, agriculture, science and technology, the construction of national defense modernization is developing forward steadily. We believe that in the future, under the party's leadership, there will certainly be new successes in the construction of national defense modernization.

Second, the superior socialist system is the most basic condition for our achieving national defense mobilization. National defense scientific research and production is collectivized, socialized labor, and it must depend on the joint efforts of the millions upon millions of people on all fronts and in all departments. The comparatively fast development of certain sophisticated sciences and technologies in our country's national defense was obtained by the joint efforts of the whole country. From the central ministries and commissions in charge of industries to the commissions at the provincial, municipality, and autonomous region levels, as well as the scientific research, academy and school, factor, commercial, trade, railway, traffic, post and telecommunications, communications, and meteorological units, they all have supported each other and closely coordinated with each other. This

is something that the capitalist countries cannot match. Because capitalists are bent solely on making profit, with each one trying to cheat or outwit the other, the purpose of their development of military equipment is to grab big profits. Therefore, they seal off from each other and keep secret science and technology, and this is bound to affect adversely the development of science and technology. The socialist system has abolished the private ownership of the means of production and set public ownership. The workers, peasants, and intellecturals have become the masters of the state, and the best possible use is made of men and materials. The limitations that capitalism put on the use of science and technology have been done away with, and a broad scope of operation has been opened for the development of science and technology, and their application to national defense. Therefore, from the long-range point of view, our country's construction of national defense will be completely able to develop at a fairly fast speed and steadily catch up to the world's advanced standards.

Third, our country has vast territory and abundant resources. It has abundant natural resources for national defense, and the national defense industry has much scope; this is the material base for our achieving national defense modernization. In the initial stage after the founding of the PRC, our country's base for national defense scientific research and national defense industry was comparatively weak, and only simple light weapons could be made. Through more than 30 years of struggle, we are already able to make by ourselves many complicated and sophisticated weapons. We have trained and tempered a large group of scientific researchers, technical talents, management talents, and proficient technical workers. We have set up on a certain scale a national defense scientific research system and a [illegible] industrial production system. At the same time we have accumulated many experiences in national defense construction. In the past several years, our country has successfully conducted many atomic bomb tests and hydrogen bomb tests, and has launched artificial earth satellites and intercontinental carrier rockets. It has become the third country in the world to master the technology of retrieving artificial earth satellites from space. Practice proves that provided that we make full use of existing conditions, are good at drawing on the experiences and lessons at home and abroad, and rationally exploit and utilize national defense natural resources, the construction of national defense modernization will take bigger strides, become more solid, and obtain greater results.

Fourth, our great motherland is one of the countries in the world with an ancient civilization, and the Chinese nation has always been famous in the world for its industriousness, courage, and abundant creative power; we certainly have the ability to complete the task of constructing national defense modernization. For many centuries, in many sciences and technologies, our country was in the van, its achievements were magnificent, and it was ahead of all countries of the world. For example, the four great inventions of paper making, printing, the compass, and gunpowder, as well as brilliant results in astronomy, mathematics, physics, and medicine, played an enormous role in mankind's progress. This is our nation's pride. After New China was founded, under the party's leadership the intelligence and wisdom of our country's people were given full play. After our country was the first in the world to develop synthetic crystalline bovine insulin, it obtained complete

success in changing yeast alanine into ribonucleic acid. This indicates that in research on synthetic living macromolecules our country continue to be in the world's advanced ranks. Our country's successful development by research of improved varieties of hybrid paddy rice and Shandong No 1 cotton, and a carrier rocket that launches three artificial satellites, puts it on the world's advanced level. We have full reason to believe that, under the party Central Committee's correct leadership, provided that the entire party, entire army, and all people in the country unite as one and jointly struggle, the prospects for our country's national defense modernization are magnificent.

The attainment of national defense modernization is a long-term process. Although we have full conditions for and staunch faith in constructing national defense modernization well, a future war of aggression will not necessarily wait until after we have done this before breaking out. Particularly in view of the fact that the class enemies at home and abroad are terribly afraid of and bitterly hate our engaging in the four modernizations, they always want to sabotage our construction of them. Scheming to subvert is a kind of sabotage, but the greatest sabotage is launching a war of aggression. Therefore, while strengthening the construction of national defense modernization, we must strengthen the concept of combat readiness, firmly establishing the idea of using inferior equipment to defeat an enemy with superior equipment, and of striving to make good preparations against a war of aggression.

At present, if war breaks out will we be able with our existing equipment to defeat an enemy with superior equipment? If we turn over the pages in the war history of our army, we clearly see: our army has a glorious tradition of using inferior equipment to defeat enemies with superior equipment. As early as the Agrarian Revolution, the Red Army relied on broadswords and long spears to smash the enemy's military "encirclement and suppression" in which he had aircraft and cannon. In the War of Resistance Against Japan, with "millet and rifles" we defeated the Japanese aggressors, who had advanced weapons. During the War of Liberation, our army's weapons and equipment were also inferior, but we defeated the Kuomintang's 8 million-strong armed forces and overthrew the Chiang family's dynasty. Several decades of revolutionary warfare prove that we are able with inferior equipment to defeat an enemy with superior equipment. However, from this we certainly cannot draw the conclusion that the backward is the superior. We must soberly realize: the backwardness of weapons is not a factor for winning victory but a factor for taking a beating. To change this balance of superiority and inferiority, certain conditions are needed. Long ago Comrade Mao Zedong pointed out: "War is a contest of strength." "Victory or defeat in war is, of course, decided by the conditions of the two sides with respect to military affairs, politics, economics, geography, the nature of the war, and international support, but it is not only decided by these conditions; they only provide the possibility of victory or defeat, and in themselves do not spell victory or defeat. To spell victory or defeat, there must be added subjective effort, and this is what guides war and wages war, and is the conscious initiative in war. In a future war against aggression, we will be able with inferior equipment to defeat an enemy with superior equipment, and our confidence in this is established on the following conditions.

First, a future war against aggression waged by our country will be a just war. A just cause enjoys abundant support support while an unjust cause finds little support. Domestically, we have ample manpower and sources of troops, and have the concerted efforts of the whole nation; internationally, we are surrounded by the world's people in the united front against hegemony, who are our sympathizers and supporters. If we make full use of these conditions, we will be able to wrest victory in a war against aggression. Second, "soldiers and people are the root of victory." People's war is our basic guarantee for our using inferior equipment to defeat an enemy with superior equipment. Provided we persist in people's war, if the enemy comes now we can, with our existing equipment, not only fight but also win. Third, the superiority and inferiority, the strength and weakness of weapons and equipment is not absolute. In superiority there is inferiority, and in inferiority there is superiority. Provided we display our strengths and avoid our weaknesses, and give full play to our strengths and advantageous factors, we can, with the strengths of inferior weapons, overcome the weaknesses of superior weapons. This superiority and inferiority in weapons of the two sides in a war can, under a certain condition, be mutually transformed. However, this "certain condition" will not come of itself, but must be created by man. That we are able with inferior equipment to defeat an enemy with superior equipment is because our party, our army, and the people of our country, on a certain material base, will fully display their subjective initiative.

Since we are able with inferior equipment to defeat an enemy with superior equipment, if we achieve national defense modernization the gap in weapons and equipment between the enemy and ourselves will be narrowed. In conjunction with our superiority in other aspects, we will then be like a tiger that has grown wings--with might redoubled--and can, at a smaller price and in a shorter time, win victory in a war against aggression.

In brief, strengthening the construction of national defense modernization is a necessity in the developing situation, is a necessity in our country's socialist modernization, and tallies with the fundamental interests of all the people of the country. To defend the four modernizations drive and the country's security and to defend world peace, we must, with the spirit of racing against time, construct national defense modernization and strengthen our national defense forces, and also must, based on our existing equipment, be prepared at all times to defeat any powerful enemy who dares to invade, and struggle hard to achieve the great goal of the four modernizations.

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